REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	12/12/58	

4. TITLE AND SUBTITLE
WASTE DISPOSAL REPORT (MONTHLY, 1957-1958)

5. FUNDING NUMBERS

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

ROCKY MOUNTAIN ARSENAL (CO.)
COMMERCE CITY, CO

8. PERFORMING ORGANIZATION REPORT NUMBER

81357R33

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

ARMY CHEMICAL CORPS
MARYLAND

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

THIS DOCUMENT CONSISTS OF THE MONTHLY WASTE DISPOSAL REPORTS INTO BASIN F FOR 1957 AND 1958. THE REPORTS ARE DIVIDED IN THE FOLLOWING AREAS; (A) LIQUID WASTE TO DISPOSAL LAKE FROM GB PLANT (QUANTITATIVE AND QUALITATIVE), (B) LIQUID WASTE TO DISPOSAL LAKE FROM SHELL CHEMICAL ACTIVITIES, (C) EVAPORATIONS FROM SEALED LAKE.

14. SUBJECT TERMS	15. NUMBER OF PAGES
GB PLANT, SEALED LAKE TEST	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED			

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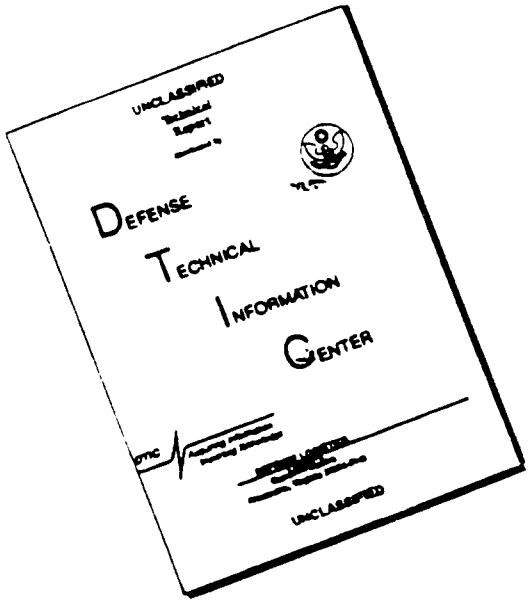

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DOCUMENT INCORPORATED INTO 81357R33

WASTE DISPOSAL REPORT, U.S. ARMY CHEMICAL ARSENAL, ROCKY MOUNTAIN ARSENAL, 1 APRIL THROUGH 30 APRIL 1957

1957 SEPTEMBER 13

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11 [illegible] 58

81357B33

Original

CMLMC-RM-OIM

12 DEC 1958

SUBJECT: Monthly Waste Disposal Report - 1 November thru 30 November, 1958.

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 November through 30 November 1958.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe)

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg
Facilities Engr

Capt Friar/nlw/451
Jan 1957

CMLMC-PM-O

SUBJECT: Waste Disposal Report

TO: Commanding General
Army Chemical Center and
Chemical Corps Materiel Command
Army Chemical Center, Maryland
Attn: Industrial Division

1. As directed in 1st Indorsement, your headquarters, 2 January 1957, to letter this headquarters, 19 December 1956, Subject: Monthly Arsenal Production Report, the first of a series of monthly waste disposal reports is submitted herewith. The report is prepared in sections as suggested by your headquarters. These are individually identified for ease and segregation.

2. There are several areas where data are not available at this time. However, action has been taken to initiate the various programs and as data become available, these sections will be more completely reported.

3. Two copies of this report are being forwarded to Chemical Corps Engineering Command and five copies are being furnished your headquarters for such distribution as you deem appropriate.

FOR THE COMMANDER:

1 Incl:
Waste Disposal Rpt
(in quint)

JOHN F. GAY
Lt Colonel, Cml C
Assistant for Manufacturing

Cy furnished:
CO, Cml C Eng Cmd
w/2 cys of Incl

[redacted]

CMLMC-RM-OIM

SUBJECT: MONTHLY WASTE DISPOSAL REPORT (1 November-30 November 1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 28,200 gallons during the month of November 1958.

2. Analysis of Effluent

Component	3 Nov 58	19 Nov 58
a. chloride ion (ppm)	261	324
b. phosphorous ion (ppm)	41	50
c. pH	12.1	11.9
d. Total solids	1875	2676
e. fluoride ion (ppm)	60	70

B. From Shell Chemical Activities (Quantative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed lake was 39,010 gallons for the month of November.

2. Analysis of Effluent

Component	3 Nov 58	19 Nov 58
a. Acetate (ppm)	570	516
b. chloride (ppm)	603	766
c. pH	5.7	11.3
d. Total solids	1619	2279

C. Evaporation

1. Surface area (mean) evaporation from sealed lake

Surface area at end of month	82.3
Surface area at beginning of month	81.7
Total	164.0

$$\text{Mean area} \quad \frac{164.0}{2} = 82 \text{ acres}$$

2. Precipitation entering lake

Total precipitation (lake area,acres)
(precipitation ft)(gallons/acre ft)

Total precipitation (.74)(82)(325,829)

Total precipitation = 19,771,303 gallons

3. Total change in volume

Elevation of lake at end of month 5196.72
Elevation of lake at beginning of month 5196.48
Total volume change of lake 150,920,000 - 144,506,000
Total volume change of lake = 6,414,000 gallons

4. Evaporation

Total liquid entering lake = effluent flow plus ppt.
Total liquid entering lake = 28,200 plus 39,010 plus 19,771,3(
Total liquid entering lake = 19,838,513 gallons

Evaporation = Total entering - total change in volume
Evaporation = 19,838,513 - 6,414,000
Evaporation = 13,424,513 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{Mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{13,424,513 \text{ gal})}{(82.0)(43,200)}$$

Evaporation = 3.8 gal/min/acre

SEALED LAKE TEST

Day of Month Nov. 58	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	45	39	6	SSW	0
2.	44	38	5	SSW	0
3.	46	37	6	SSW	0
4.	24	51	7	SE	0
5.	63	33	11	SSE	.11
6.	86	30	7	WSW	0
7.	36	52	5	ENE	T
8.	25	47	14	S	T
9.	53	45	7	SSW	0
10.	36	49	5	SSW	0
11.	59	39	3	ENE	0
12.	77	30	5	SSW	0
13.	35	45	6	SSW	T
14.	40	44	9	S	0
15.	82	25	3	SE	0
16.	80	27	13	SSW	.02
17.	78	15	5	N	.31
18.	45	25	11	SSW	.05
19.	44	34	6	S	0
20.	52	37	10	NW	0
21.	41	42	9	SSW	0
22.	64	36	10	SW	0
23.	53	50	15	SSW	0
24.	28	43	17	S	0
25.	71	25	10	NE	0
26.	74	12	6	ENE	0
27.	86	15	8	NW	T
28.	54	13	13	S	.25
29.	56	28	9	SSW	0
30.	56	32	14	SSW	0
31.					
TOTAL	1633	1038	255.		.74
AVERAGE	54.4%	34.6	8.5		

RMA-T-491-(12 Mar 1957)

PMSmith/eh/451
26 Nov

CMLMC-RM-OIM

SUBJECT: Monthly Waste Disposal Report (1 Oct thru 31 Oct 1958)

2- DEC 1958

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 October through 31 October 1958.

FOR THE COMMANDER:

1 Incl
a/s (In dupe)

Copy furnished:
Asst for Mfg ✓
Facilities Engr

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

R.N.BODINE

P.M.SMITH

CMLMC-RM-OIM
SUBJECT: Monthly Waste Disposal Report (1 October thru 31 October 1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 20,900 gallons during the month of October 1958.

2. Analysis of Effluent

Component	1 Oct 58	15 Oct 58
a. Chloride ion (ppm)	213	279
b. Phosphorous ion (ppm)	70	90.0
c. pH	12.5	11.8
d. Total solids	-	260.9

B. From Shell Chemical Activities (Quantative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed Lake was 743,260 gallons for the month of October.

2. Analysis of Effluent

Component	1 Oct 58	15 Oct 58
a. Acetate (ppm)	558	390
b. Chloride (ppm)	240	288
c. pH	5.2	5.4
d. Total solids (ppm)	-	1617

C. Evaporation

1. Surface area (mean) evaporation from sealed lake

Surface area at end of month	81.70
Surface area at beginning of month	81.60
Total	163.30

$$\text{Mean area } \frac{163.30}{2} = 81.65 \text{ acres}$$

2. Precipitation entering lake
Total precipitation (lake area, acres)
(precipitation ft)(Gallons/acre ft)

Total precipitation = (81.65)(.03) (325,829)
Total precipitation = 798,128 gallons

SUBJECT: Monthly Waste Disposal Report (Oct cont'd)

3. Total change in volume:

Elevation of lake at end of month 5196.48
Elevation of lake at beginning of month 5196.47

Total volume change of lake = Volume at 5196.48 - Vol. 5196.47
Total volume change of lake = 144,500,800 - 144,239,000
Total volume change of lake = 261,800 gallons

4. Evaporation

Total liquid entering lake = Effluent flow plus precipitation
Total liquid entering lake = 743,260 plus 20,900 plus 798,128
Total liquid entering lake = 1,562,288 gallons

Evaporation = Total entering - total change in volume
Evaporation = 1,562,288 - 261,800
Evaporation = 1,300,488 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{1,300,488}{(81.65)(44,640)}$$

Evaporation = .35 gal/min/acre

SEALED LAKE TEST

Day of Month	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	44	61	10	S	T
2.	47	52	4	NW	.06
3.	53	42	16	SSW	0
4.	57	29	12	SSW	0
5.	55	42	5	NNW	0
6.	57	36	9	SSW	0
7.	56	35	11	SSW	0
8.	65	18	19	W	0
9.	48	46	36	SW	0
10.	40	56	6	SSW	0
11.	52	38	11	SSW	0
12.	57	36	12	SSW	0
13.	58	33	14	SSW	0
14.	58	33	8	SSW	0
15.	55	25	16	SSW	0
16.	57	29	10	SSW	0
17.	48	41	7	WNW	0
18.	54	22	16	SSW	0
19.	60	18	8	S	0
20.	48	22	14	NW	0
21.	45	26	10	W	0
22.	39	35	14	SSW	0
23.	48	10	18	SSW	0
24.	44	20	8	SSW	0
25.	37	62	10	NW	0
26.	41	82	2	SW	.02
27.	35	94	3	NNW	0
28.	40	92	6	N	T
29.	33	92	7	NW	.17
30.	30	86	2	SSW	.12
31.	34	65	4	SSW	0
TOTAL	1495	1382	328		.37
AVERAGE	48.22	44.58	10.58		

RMA-T-491-(12 Mar 1957)

CMLMC-RM-OIM

SUBJECT: Monthly Waste Disposal Report (September 1958)

2nd DEC 1958

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 September through 30 September 1958.

FOR THE COMMANDER:

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

1 Incl:
a/s (In dupe)

Copy furnished:
Asst for Mfg
Fac Engr

CMLMC-RM-OIM
SUBJECT: Monthly Waste Disposal Report (1 September thru 30 Sept,1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 30,000 gallons during the month of September.

2. Analysis of Effluent

Component	1 Sept 58	15 Sept 58
a. Chloride ion ppm	252	247
b. Phosphorous ion ppm	101	-
c. pH	12.3	12.1
d. Total solids (ppm)	2814	2283

B. From Shell Chemical Activities (Quantitative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed lake was 1,270,090 gallons for the month of September.

2. Analysis of Effluent

Component	1 Sept 58	15 Sept 58
a. Acetate (ppm)	450	576
b. Chloride (ppm)	214	189
c. pH	7.6	7.4
d. Total solids (ppm)	607	747

C. Evaporation

1. Surface area (mean) evaporation from sealed lake.

Surface area at end of month : 81.60
Surface area at beginning of month : 81.60
Total 163.20

Mean area = $\frac{163.20}{2}$ = 81.60 acres

2. Precipitation entering lake

Total precipitation (lake area,acres)
(precipitation, ft)(gallons/acre foot)
Total precipitation : (81.60)(.176) (325,829)
Total precipitation : 4,679,352 gallons

Subject; Monthly Waste Disposal Report (Sept)

3. Total change in volume.

Elevation of lake at end of month = 5196.47
Elevation of lake at beginning of month= 5196.47

Total volume change of lake =Volume at 5196.47 - vol at 5196.47
Total volume change of lake = 145,040,000-145,040,000
Total volume change of lake = 0 gallons

4. Evaporation.

Total liquid entering lake = Effluent flow plus precipitation
Total liquid entering lake = 30,000 plus 1,270,000 plus 4,679,352
Total liquid entering lake = 5,979,442 gallons

Evaporation = Total entering-Total change in volume
Evaporation= 5,979,442 - 0
Evaporation = 5,979,442 gallons

$$\text{Evaporation rate} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation rate} = \frac{5,979,442}{(81.7)\ (43,200)}$$

Evaporative rate = 1.69 gal/min/acre

SEALED LAKE TEST

Day of Month	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	62	40	10	SSW	0
2.	72	22	12	SSW	0
3.	60	38	4	ESE	0
4.	60	61	6	S	T
5.	66	52	11	SW	T
6.	62	62	9	WSW	T
7.	64	55	5	SSW	0
8.	68	46	4	WSW	0
9.	67	48	12	SSW	0
10.	62	64	9	S	0
11.	66	64	6	W	0
12.	66	51	9	SSW	0
13.	75	41	12	SSW	0
14.	58	60	8	NNE	0
15.	52	59	6	WSW	0
16.	46	72	9	SW	.89
17.	56	44	14	SSW	0
18.	63	40	12	SSW	0
19.	59	47	13	SSW	0
20.	66	26	16	SSW	0
21.	51	55	5	WNW	0
22.	64	34	9	SSW	0
23.	69	30	12	SSW	0
24.	65	31	11	SW	0
25.	48	53	9	S	.5
26.	49	51	7	NNE	.7
27.	46	71	8	SSW	0
28.	55	52	7	SSW	0
29.	62	46	10	SSW	0
30.	37	75	9	E	.03
31.					
TOTAL	1855	1490	274		2.12
AVERAGE	61.83	49.67	9.13		

Lt.Bongiovanni/eh/451
9 Jan 1958

CMLMC-RM-GI

SUBJECT: Monthly Waste Disposal Report — JAN 1958

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 December through 31 December 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe)

N. H. CRANDELL
Major CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg
Fac Engr Div

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL
ROCKY MOUNTAIN ARSENAL
DENVER 2, COLORADO

1 DECEMBER THROUGH 31 DECEMBER 1957

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 781,600 gallons during the month of December.

2. Analysis of Effluent

Component	16 December 1957	1 January 1958
a. Chloride ion (ppm)	144.0	605.1
b. Fluoride ion (ppm)	46.4	287.5
c. Phosphorous ion (ppm)	128.5	126.3
d. pH	11.62	12.4

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to the sealed lake totaled 2,235,000 gallons (50 gpm) during the month of December.

2. Analysis of Effluent

Component	16 December 1957	1 January 1958
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	1932	6064
c. Chloride ion (ppm)	2773	5134
d. pH	7.20	10.8

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month = 80.81 acres
Surface Area at Beginning of Month = 80.74 acres
Total 161.55 acres

Mean Area = $\frac{161.55}{2}$ = 80.77 acres

WASTE DISPOSAL REPORT (Cont'd)

2. Precipitation Entering Lake

Total Precipitation = (Mean Area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.77)(0.005)(325,829)

Total Precipitation = 133,000 Gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5,196.09
Elevation of Lake at Beginning of Month = 5,196.06

Total Volume Change of Lake = Vol at 5,196.09 - Vol at 5,196.06
Total Volume Change of Lake = 134,093,000 - 133,292,000
Total Volume Change of Lake = 801,000 Gallons

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 2,235,000 + 781,600 + 133,000
Total Liquid Entering Lake = 3,149,600 Gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 3,149,600 - 801,000
Evaporation = 2,348,600 Gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{2,348,600}{(80.77)(44,640)}$$

Evaporation = 0.653 gal/min/acre

Lt RW Bongiovanni/je/451
9 December 1957

CMLMC-RM-OI

SUBJECT: Monthly Waste Disposal Report

12 DEC 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 November through 30 November 1957.

FOR THE COMMANDER:

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

1 Incl:
s/s (In dupe -)

Copy furnished:
Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Industrial
Engineering Division

CONCURRED IN: GEORGE F. DONNELLY
Chief, Facility
Engineering Division

ASST FOR MFG

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL
ROCKY MOUNTAIN ARSENAL
DENVER 2, COLORADO

1 NOVEMBER THROUGH 30 NOVEMBER 1957

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 394,800 gallons during the month of November.

2. Analysis of Effluent

Component	15 November 1957	2 December 1957
a. Chloride ion (ppm)	127.4	210.6
b. Fluoride ion (ppm)	5.4	27.6
c. Phosphorous ion (ppm)	12.6	25.7
d. pH	11.65	10.8

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to the sealed lake totaled 2,160,000 (50 gpm) gallons during the month of November.

2. Analysis of Effluent

Component	15 November 1957	2 December 1957
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	2984	3886
c. Chloride ion (ppm)	1209	2215
d. pH	7.75	11.3

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month = 80.4 acres
Surface Area at Beginning of Month = 80.2 acres
Total 160.6 acres

Mean Area = $\frac{160.6}{2}$ = 80.3 acres

2. Precipitation Entering Lake

Total Precipitation = (Mean Area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.3)(0.041)(325,829)

Total Precipitation = 1,070,000 Gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5,196.06
Elevation of Lake at Beginning of Month = 5,195.94

Total Volume Change of Lake = Vol at 5,196.06 - Vol at 5,195.94
Total Volume Change of Lake = 130,000,000 - 127,000,000
Total Volume Change of Lake = 3,000,000 Gallons

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 394,800 + 2,160,000 + 1,070,000
Total Liquid Entering Lake = 3,624,800 Gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 3,624,800 - 3,000,000
Evaporation = 624,800 Gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{624,800}{(80.3)(43,200)}$$

Evaporation = 0.18 gal/min/acre

LT RW Bongiovanni/je/451
20 November 1957

CMLMC-RM-OI

SUBJECT: Monthly Waste Disposal Report

21 NOV 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 October through 31 October 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe - FOUO)

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

Copy furnished:
Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Industrial
Engineering Division

CONCURRED IN: GEORGE F. DONNELLY
Chief, Facility
Engineering Division

Incl 1-As listed Above

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 OCTOBER THROUGH 31 OCTOBER 1957

[redacted]

I. LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 622,600 gallons during the month of October.

2. Analysis of Effluent

Component	15 October 1957	3 November 1957
a. Chloride ion (ppm)	107.0	237.2
b. Fluoride ion (ppm)	2.68	17.4
c. Phosphorous ion (ppm)	Nil	54.6
d. pH	11.19	12.15

B. From Shell Chemical Activities

1. Effluent from the Shell Chemical Plant to the sealed lake totaled 1,340,000 gallons during the month of October.

2. Analysis of Effluent

Component	15 October 1957	3 November 1957
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	3348	2705
c. Chloride ion (ppm)	3134	1677
d. pH	11.95	9.8

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month	=	80.2 acres
Surface Area at Beginning of Month	=	80.0 acres
Total		160.2 acres

Mean Area = $\frac{160.2}{2}$ = 80.1 acres

2. Precipitation Entering Lake

Total Precipitation = (Mean area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.1)(0.22)(325,829)

Total Precipitation = 5,730,000 gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5195.94 ft.
Elevation of Lake at Beginning of Month= 5195.82 ft.

Total Volume Change of Lake = Vol at 5195.94 - Vol at 5195.82
Total Volume Change of Lake = 126,000,000 - 125,000,000
Total Volume Change of Lake = 1,000,000

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 622,600 + 1,340,000 + 5,730,000
Total Liquid Entering Lake = 7,692,600 gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 7,692,600 - 1,000,000
Evaporation = 6,692,600 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{6,692,600}{(80.1)(44,640)}$$

$$= 1.87 \text{ gal/min/acre}$$

[redacted]

...chran/eh/451
...t 57

CMLMC-M-OI

SUBJECT: Monthly Waste Disposal Report 1 NOV 195...

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 September through 30 September 1957.

FOR THE COMMANDER:

1 Incl:
s/s (in dup-FOUO)

H. H. CRANDELL
Major CmlC
Assistant for Manufacturing

Asst for Mfg

Copy furnished:
✓ Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Indus Engr Div

CONCURRED IN: George F. Donnelly
Chief, Facility
Engr Div

Encl 1- as listed above

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 September through 30 September 1957

[redacted]

1. LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer facility 1727, which is pumped to the sealed lake was metered at 1,016,500 gallons during the month of September.

2. Analysis of Effluent (ppm)

A.

Date	Total Solids	Nitrate	Fluoride	Chloride	Phosphorous
30 Aug	1318	1.3	3.2	232	7
16 Sept	1099	1.4	1.62	162	4.2

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to sealed lake totaled 4,320,000 (100 gpm) during the month of September.

2. Analysis of Effluent (ppm)

A.

Date	Total Solids	Nitrate	Fluoride	Chloride	Phosphorous
30 Aug	12050	12.7	1.5	1400	11.7
16 Sept	5633	5.1	3.0	1320	6.0

C. From Chlorine Plant

There was no dumping from the Chlorine Plant for the month of September. Operation of the plant has ceased.

D. Flow from Lake A

Lake A has been drained. There was no flow from the lake for September.

E. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at end of month = 79.7 acres
Surface Area at beginning of month = 79.5 acres

Total 159.2 acres

Mean Area = $\frac{159.2}{2}$ = 79.6 acres

2. Precipitation entering lake

Total precipitation = (Mean area lake, acres)(precipitation ft.)(ga/ acre ft)

[redacted]

Total precipitation = 79.6 (0.041) (325,829)

Total precipitation = 1,050,000 gallons

3. Total Change in Volume

Elevation of lake at end of month = 5195.82
Elevation of lake at beginning of month = 5195.78

Total volume change of lake = volume at 5195.82 - volume at 5195.78
Total volume change of lake = 126,590,000 -
125,590,000
= 1,000,000 gallons

4. Evaporation

Total liquid entering lake = effluent flow + precipitation
Total liquid entering lake = 1,016,500 + 4,320,000 + 1,050,000
= 6,386,500
- Total change in volume = 1,000,000

Evaporation = 5,386,500 gallons

$$\text{Evaporation} = \frac{(\text{gal/mo.})}{(\text{Mean acre})(\text{min/mo.})}$$

$$\text{Evaporation} = \frac{5,386,500}{79.6\ (43,200)}$$

= 1.57 gal/min/acre

II. Local Activities

A. Status of lake drainage

Lake A has been drained.

B. Status of Sealed Lake

The sealed lake has been repaired.

C. The following are the elevations above sea level of water in wells from measurements taken each week for the past five weeks:

[redacted]

USGS Well Number	READING 22 Aug 57	READING 29 Aug 57	READING 5 Sept 57	READING 12 Sept.57	READING 19 Sept. 57
2-67-3eccl	5029.3	5029.8	5029.7	5029.3	5029.3
2cdcl	5044.9	5045.2	5045.4	5045.6	5045.5
9cddl	5038.9	5039.1	5038.9	5038.8	5038.7
9ddbl	5043.5	5042.8	5042.2	5042.7	5042.7
10aba2	-	5036.0	5036.5	0	0
10bdbl	5038.9	5038.9	5038.8	5038.7	5038.2
10abdl	5040.5	5040.8	5041.2	5041.6	5041.6
10cddl	5057.6	5058.4	5058.4	5058.4	5058.7
11bccl	5050.6	5051.4	5051.6	5051.8	5051.9
11ccdl	5055.6	5056.3	5056.6	5057.2	5057.2
12abdl	5108.8	5108.9	5108.8	5108.8	5108.8
16bdd3	5056.9	5057.0	5057.0	-	-
16ccd2	5068.0	5068.2	5067.9	-	-
16ddd2	5076.5	5076.6	5076.3	5075.6	5075.5
15cdbl	5070.6	5071.4	5071.1	5070.9	5070.7
15dcbl	5075.3	5075.3	5075.1	5074.9	5070.6
22ddcl	5148.6	5148.6	5148.6	5148.6	5148.7
23ccal	5149.0	5149.0	5149.0	5149.1	5149.2
23acel	5147.6	5147.6	5147.5	5147.6	5147.6
23addl	5146.4	5146.2	5145.8	5146.0	5146.0
24bddl	5146.8	5146.7	5146.7	5146.6	5146.5
27baal	5062.0	5062.0	5062.0	5062.0	5062.0
27dddl	5147.7	5147.8	5147.6	5147.9	5147.8
33bcbl	5107.9	5108.1	5108.2	5108.3	5108.4

[redacted]

CMLMC-EN-OI

NP Cochran/je/532
13 December 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim

13 DEC 1957

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Materiel Command
Army Chemical Center, Maryland
ATTN: Mr. David Falck

1. Confirming telephone conversation, 12 December 1957, between Mr. David Falck, your Headquarters, and the undersigned, the following information is forwarded for transmittal to the Office of the Chief Chemical Officer.

WEARE WELL WATER ANALYSIS (ppm)

Sample Date	Total Solids	Fluoride	Chloride	Nitrate	Phosphorous
5 Nov 1957	2646	1.32	--	6.5	7.4
12 Nov 1957	2511	1.40	593	20.1	Nil
19 Nov 1957	2337	1.44	605	12.1	Nil
26 Nov 1957	2324	1.40	622	7.1	Nil
3 Dec 1957	2278	1.36	635	19.3	Nil

2. All the above samples were non-toxic in plant growth tests.

Copy furnished:
CO, US ACmlC Engr Command, ACC, Maryland
Attn: Deputy for Engineering

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN
Project Officer

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

ASST FOR MFG

NP Cochran/je/532
22 November 1957
25 NOV 1957

CMLMC-RM-OI (8 Nov 1957) 1st Ind

SUBJECT: Request from OTS, Department of Commerce

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Office of the Chief Chemical Officer, Department of the Army, Washington 25, D. C. Attn: Technical Liaison Officer

Previous correspondence on this subject was contained in first indorsement, CMLMC-RM-OI, dated 8 November 1957, to basic letter, CMLWA-T, dated 22 October 1957, same subject. This previous correspondence cited potential claims against the Government and requested clarification of potential release to the general public.

Incl w/d

R. L. MARTIN
Colonel, Cml C
Commanding

Copy furnished:
Asst for Mfg

N. H. CRANDELL, Major, Cml C
Assistant for Manufacturing

NEAL P. COCHRAN, Chief, Industrial Engineering Division

Brief: The Department of Commerce apparently picks up a listing of our Progress Reports from Colorado University off an ASTIA List. In previous correspondence, we have requested permission to withhold the reports pending a statement from the Department of Commerce that they do not propose to release the reports to the general public. This request and our previous correspondence apparently crossed enroute since our indorsement was dated 8 November 1957 and the request from MatCom both the same date.

ASST FOR MFG

NP Cochran/je/532
21 November 1957

CMLMC-RM-OI

22 NOV 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim (Correction)

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Material Command
Army Chemical Center, Maryland
ATTN: Assistant, Industrial Division

1. Reference First Indorsement, CMLMC-RM-OI, dated 19 November 1957, same subject, to basic letter from CMLAM-M-2P-42, dated 28 October 1957.

2. It is requested that the following correction be made to Inclosure 2, Appendix IV: Change date from "12 June to 24 September 1957" to "8 November 1954 to 4 June 1956".

FOR THE COMMANDER:

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

Copy furnished:
CO, US ACmlC Engr Command, ACC, Md
Attn: Deputy for Engineering

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

ASST FOR MFG

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Telephone Conversation 22 Nov 57 - 1000

From: Mr. L. E. Garono, U. S. Army Chemical Corps Engineering Command, ACC, Md

To: Mr. N. P. Cochran, Chief, Industrial Engineering Division, RMA

1. Mr. Garono called in regard to our Status Report, Weare Claim, which was sent as Inclosure 1 to 1st Ind, CMLMC-RM-OI, dated 19 November 1957, Subj: Chemical Corps Responsibility for Damages - Weare Claim. Mr. Garono felt that Paragraph 3.a., Conclusions, was an overstatement of responsibility and that the wordage could be changed to something like, "contributed to" rather than "responsible for".

2. Mr. Cochran agreed and asked if he wished to have the report withdrawn, and he stated, "no", that he thought MatCom would review the report.

3. In addition, Mr. Cochran informed Mr. Garono that we had completed our estimate for the "V" Project, that the total was $4,500,000 and that copies had been forwarded to MatCom.

4. Mr. Cochran confirmed his visit to ACC for purposes of review of the GB Report.

Telephone Conversation 22 November 57 - 1040

From: Mr. D. A. Falck, U. S. Army Chemical Center and CmlC MatCom, ACC, Md

To: Mlr.N. P. Cochran, Chief, Industrial Engineering Division, RMA

1. Mr. Falck called concerning the same subject as above. Mr. Cochran agreed to his changing the next to the last sentence in Paragraph 2.b. from "An analysis of this information reveals that acceptance of responsibility for high salinity eliminates liability for toxic effects." to "An analysis of this information reveals that there is no apparent correlation between high salinity and phytotoxicity.", and Paragraph 3.a. from "Rocky Mountain Arsenal is responsible for high salinity in the ground water northwest of the Arsenal generally as indicated in Appendix II." to "Rocky Mountain Arsenal has contributed to the apparent high salinity in the ground water northwest of the Arsenal generally as indicated in Appendix II."

2. Mr. Falck stated that he would attempt to arrive at one report (Our document indicated above stated 15 January 1958) rather than another report on the Weare Claim in December and a comprehensive report again in January.

3. Mr. Cochran reiterated to Mr. Falck the statements he has made to various people in the past, namely, that the Colorado University Contract is not specific to the Weare Claim and in fact, all organizations and individuals concerned, during the negotiation period, had recommended that it not be specific to or specifically investigate Mr. Weare's Well. On this basis, it is his opinion that we cannot ask Colorado University for a specific statement

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concerning Chemical Corps responsibility for the damages sustained by Mr. Weare. He emphasized this very strongly to Mr. Falck, and stated specifically that the Status Report, which we had supplied, was his opinion and his opinion only.

Copy furnished:
Deputy Commander
Asst for Mfg

NEAL P. COCHRAN
Chief, Industrial
Engineering Division

NP Cochran/je/532
18 November 1957

CMLMC-RM-OI (28 Oct 57) 1st Ind

19 NOV 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Commanding Officer, U. S. Army Chemical Center and Chemical Corps Materiel Command, Army Chemical Center, Maryland. Attn: Assistant, Industrial Division

1. The Status Report requested in basic communication has been completed and is inclosed.

2. This report indicates that this Arsenal is not liable for the damages sustained by Mr. Weare and recommends so advising the Judge Advocate General. This Headquarters concurs in the recommendation as stated in the attached report.

3. The Colorado University Contract, cited in the inclosed report, is scheduled for completion on or before 31 December 1957, and a more comprehensive report will be issued on or before 15 January 1958.

1 Incl:
w/d 1 Incl - 1
Added 1 Incl
2. Status Rpt (In quadruple)

R. L. MARTIN
Colonel, CmlC
Commanding

Copy furnished:
CO, US ACmlC Engr Command, ACC, Md
Attn: Deputy for Engineering

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief, Industrial Engineering Division

Brief: Report was requested by MatCom to enable Colonel Lough to present legal information to the Chief. MatCom and OCCmlO have been informed of the additional report to be issued later and agree.

ASST FOR MFG

NP Cochran/je/532
7 November 1957

CMLMC-RM-OI

SUBJECT: Plant Growth on Disposal Lake A Bottom

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Material Command
Army Chemical Center, Maryland
ATTN: Mr. David Falck

1. Forwarded for your information are photographs of plant growth on the Disposal Lake A bottom.

2. Growth of these plants in Lake A soil, which was beneath the surface of the lake for at least five (5) years, does not agree with the University of Colorado findings which showed that soil watered with Powers' water retained its toxicity. This is a strong indication that Lake A is not the source of contamination of the ground water northeast of Rocky Mountain Arsenal.

3 Incls:
Photographs

NEAL P. COCHRAN
Project Officer

Copy furnished:
CO, CmlC Engr Command, ACC, Md
Attn: Dep for Engineering
Office of Chief CmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan
CO, CmlC BW Labs, Ft. Detrick, Frederick, Md
Attn: Dr. Robert L. Weintraub

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NP Cochran/je/532
7 November 1957

CMLMC-RH-OI (22 Oct 57) 1st Ind

SUBJECT: Request from OTS, Department of Commerce

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Office of the Chief Chemical Officer, Department of the Army, Washington 25, D.C. Attn: Technical Liaison Officer

1. Work under terms of Contract DA-05-021-CML-10,092 has not been completed and is continuing. Progress Reports, to date, contain information which could lead to claims against the Government, and as a result, this Headquarters would recommend that release to the Department of Commerce is not advisable at this time.

2. Progress Reports on the subject contract can be supplied if it is understood that they are not for distribution to the general public.

ASST FOR MFG

1 Incl:
w/d

R. L. MARTIN
Colonel, Cml C
Commanding

Copy furnished:
Asst for Mfg

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

NEAL P. COCHRAN, Chief, Industrial Engineering Division

CL Friar/je/451
14 October 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

16 OCT 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Garono

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 12 October 1957.

FOR THE COMMANDER:

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

1 Incl:
a/s (In trip)

Copy furnished:
OCCmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan

Copy furnished:
Asst for Mfg

CLYDE L. FRIAR, Captain, CmlC
Acting Chief, Indus Engr Division

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 12 October 1957

14 October 1957

1. Progress continues on the Preliminary Report and Request for Authorization which is due the end of October.

2. Mr. J. H. Dolitf of Champlain Oil and Refining Company was consulted. He supplied copies of core analyses and sample descriptions of their well in Section 3-2N-65W. In addition, electric log and test data was made available and generally completed the tabulation of all data possible.

FRANK R. INGRAHAM
Pfc, CmlC

PETER T. LUCAS
Pfc, CmlC

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Telephone Conversation 9 Oct 57 - 1100

From: Mr. Neal P. Cochran, Chief, Industrial Engineering Division, RMA

To: Dr. Robert L. Weintraub, Biological Warfare Labs, Ft. Detrick, Frederick, Maryland

1. Dr. Weintraub is now in charge of the project for RMA water, and Mr. Cochran asked him why we haven't received any copies of the report and the status of what they are doing at Fort Detrick. He stated that a report would be sent within a week or two.

2. Dr. Weintraub stated that they have a satisfactory assay test method and have fractioned residues with several active materials. They are not as far along as the Colorado University people, and he did not see the last two or three reports until recently. Mr. Cochran explained that there had been some delay on them and that the August report was being held up for some corrections to be made by the Colorado University.

3/ The Biological Labs are going over much the same work that the Colorado University has been doing in recent months, and they requested some more water samples. Mr. Cochran stated that the water has been changing and the samples would not be the same as Mr. Powers' Well, which used to be auite toxic, is non-toxic at the moment. Two more carboys of Powers' water and A-49 are to be sent to them.

4. Dr. Arthur Newman has transferred to the Department of Agriculture in Washington, D. C., and their Division is being closed down but will be there for a couple of months.

5. Mr. Cochran stated that any information they wanted from him would be furnished if he has it and that he will call Dr. Weintraub sometime before the first of the year and ask him to come out and look at what the Colorado University is doing, as it will be desirable to exchange ideas.

Copy furnished:
Deputy Commander
Asst for Mfg

NEAL P. COCHRAN
Chief, Industrial
Engineering Division

Edwin Newman

4817

NP Cochran/je/532
7 October 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

7 - OCT 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Garone

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 5 October 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In trip)

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

Copy furnished:
OCCmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 5 October 1957

7 October 1957

1. Mr. Glen Scott and Mr. R. H. McLaughlin were contacted at the U. S. Geological Survey in Denver, Colorado, regarding possible zones below the Lakota and Lyons. It appears that the Fountain, the principle formation below the Lyons at a depth of approximately 10,000 feet under Rocky Mountain Arsenal, has a thickness ranging from 400 to 1000 feet. In general, the Fountain is a coarse arkosic sandstone(more than 20% Feldspar; Al, K, Na, Ca, SiO_2) and conglomerate with numerous streaks of red, silty mudstones. It is believed that the amount of clays would be an inhibiting factor to successful disposal.

2. Work continues emphasizing the Lakota sandstone as the most favorable zone for disposal.

a. A structure map of the Lakota in the region has been completed. This shows the Lakota to be at 3470 feet below sea level under the Arsenal.

b. Dowell, Inc., is analyzing a core sample of the sand to determine solubility and stability of the minerals and specifically, the swelling properties of the clays. These results will indicate whether there will be appreciable swelling causing a reduction in permeability. Dowell will then be able to recommend inhibitors, if necessary.

c. Additional information was obtained on fracturing and treating techniques.

d. Schlumberger Well Surveying Corporation supplied log interpretation data and checked the Johnston Well results.

e. Calculations are being made to estimate the injection rate and pressure characteristics of the Lakota formation using the test data from the Johnston Well.

Frank R. Ingraham

FRANK R. INGRAHAM
Pfc, CmlC

Peter T. Lucas

PETER T. LUCAS
Pfc, CmlC

NP Cochran/je/532
30 September 1957

CMLMC-RM-OI

30 SEP 1957

Dr. Erik K. Bonde
Department of Biology
University of Colorado
Boulder, Colorado

Dear Dr. Bonde:

We have received your letter, dated 18 September 1957, and find that your comments to Mr. Cody meet with our approval.

If you should receive any additional correspondence from Mr. Cody, we request that you do not supply any information which is connected with research performed under terms of your contract without prior approval of this office. We will be happy to review any additional correspondence you have with Mr. Cody and will be glad to approve release of information which is not against the best interests of the Government.

Very truly yours,

NEAL P. COCHRAN
Project Officer

1 Incl:
Ltr to R.J. Cody,
dtd 18Sept57

Copy furnished:
Asst for Mfg

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

ASST FOR MFG

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UNIVERSITY OF COLORADO

BOULDER, Colorado

DEPARTMENT OF BIOLOGY

Sept. 18, 1957

Mr. Raymond J. Cody
7700 West 57th Avenue
Arvada, Colorado

Dear Mr. Cody:

I and several colleagues have been studying the toxic effects of certain wells near Henderson, Colorado, as you know. We are interested in isolating and identifying the materials responsible for crop damage and in finding ways of preventing the damage. The task of isolating such materials, as would be expected, is proving very difficult, since any one of a large number of substances may be a toxic agent.

Since we have not succeeded in identifying a toxic agent from water samples, I am in no position to give you helpful suggestions at this time. Treatment of water in the laboratory with ammonia has not resulted in alleviation of damaging effects. Dilution of well water with non-toxic water would of course reduce the harmful effects, but a sufficient dilution to avoid damage may not be practical. Recent indications are, however, that the quality of the ground water is greatly improved. This may possibly be a seasonal effect or a more permanent result of increased rainfall.

I shall be glad to transmit to your clients any future information that may be of aid to them in solving their agricultural problems.

Yours sincerely,

Erik K. Bonde
Assistant Professor of Biology

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NP Cochran/je/532
26 September 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

27 SEP 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Gerono

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 21 September 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In trip)

Copy furnished:
OCCmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan

Copy furnished:
Asst for Mfg

W. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

ASST FOR MFG

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 21 September 1957

24 September 1957

1. Observation of the Johnston Deep Well, east of Rocky Mountain Arsenal, was maintained with frequent trips out to the well site. The top of the Lyons Sandstone was encountered at approximately 9,435 feet. The well was cored eighteen (18) feet from 9,444 feet to 9,462 feet from which representative samples were obtained. The core samples are being analyzed by Core Labs, Inc. Preliminary results indicated a tight sandstone with much siliceous cementation between the sub-angular, sub-rounded, well sorted sand grains. There was much banding comprised of ferruginous, silty material, uniform in dip approximately 25° - 30°. The well-laminated nature tends to restrict vertical permeability. Tests run on the permeability indicated flow rates of practically nothing. Porosity was less than 5%.

2. On 21 September, the well was abandoned at a total depth of 9,462 feet, finding no commercial hydrocarbon production. Complete final logs and test data will be obtained from the operator in the next few days.

3. During the week, a sample of well water from the Lyons formation, from the Black Hollow Field northeast of Rocky Mountain Arsenal, was analyzed with the following results:

a.	Total Solids	-	31,833 ppm
b.	Cl^-	-	11,650 ppm
c.	NO_3	-	0
d.	F^-	-	2.16
e.	SO_4	-	(To be rechecked)
f.	pH	-	7.5

4. Raw brine, acidized to 10% HCl acid solution, was obtained and is available for testing on any core samples. Cost estimates for special permeability tests were obtained from Core Labs, Inc., to determine water-brine saturation rates. These analyses would include ratio curves comparing permeability of a given core sample with brine as against air.

5. In order to obtain basic quantitative data pertinent to the project, the following persons were contacted by Pfc Ingram:

a. Mr. William Hubbard, Petroleum Engineer, American Metals Company

b. Mr. C. F. Blankenhorn, Reservoir Engineer, Shell Oil Company

c. Mr. J. T. Taylor, Stratigrapher, Shell Oil Company

Arrangements were made with Mr. Taylor to use Shell's files and data on wells surrounding Rocky Mountain Arsenal. Literature on water-flooding techniques was also obtained.

FRANK R. INGRAHAM
Pfc, CmlC

NP Cochran/je/532
23 September 1957

CMLMC-RM-OI (11 Sept 57) 1st Ind

SUBJECT: Information on Water Samples

24 SEP 1957

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado'

TO: Commanding Officer, U. S. Army Biological Warfare Laboratories, Fort Detrick, Frederick, Maryland. Attn: Director of Research

1. Reference is made to basic letter.

2. Monthly Reports on the Colorado University Contract were not forwarded to your Headquarters on schedule as a result of certain reorganizations and "Reduction in Force" on the Arsenal. Reports for June and July were sent on 17 September 1957. The August report has not been received from Colorado University, as of this date, as a result of the vacation period for the Project Head.

3. The water from the Powers' and A-49 Well was sampled on 23 July 1957. Chemical analyses (ppm) of the well waters are as follows:

WELL	DISSOLVED SOLIDS	CHLORIDES	FLUORIDES	NITRATE	PHOSPHOROUS
A-49	6590	2913	4.8	1.0	90.0
Powers	1690	441	Nil	7.0	0.4

4. Enclosed are chemical analyses of water samples since 30 July 1957.

FOR THE COMMANDER:

1 Incl:
a/s

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

ASST FOR MFG

CMLMC-RM-OI

18 SEP 1957

SUBJECT: Evaluation of Investigations on Ground Water Contamination Problem

TO: Commanding Officer
U. S. Army Biological Warfare Laboratories
Fort Detrick
Frederick, Maryland
ATTN: Dr. Arthur S. Newman

1. Reference is made to letter, CMLRD-RM-10-C, dated 20 June 1957, same subject.

2. In accordance with request, fifty (50) gallon samples of water from Arsenal Well A-49 and Mr. Powers' well were shipped to your Headquarters on 31 July 1957. These samples were shipped in twenty-five (25) gallon acid carboys, as we have found this water reacts with metal drums.

3. Monthly reports on the Colorado University Contract were not forwarded to your Headquarters on schedule as a result of certain reorganizations and "Reductions in Force" on the Arsenal. Reports for June and July were sent on 17 September 1957. The August report has not been received from Colorado University, as of this date, as a result of the vacation period for the Project Head.

4. Paragraph 5 of referenced letter recommended certain actions be considered in the Colorado University investigations including:

a. Pumping of Wells Before Sampling:

All wells which have been sampled that are equipped with pumps are pumped before a sample is taken. Since a number of the wells are not so equipped, this is not always possible. The Corps of Engineers is currently drilling a series of approximately forty (40) wells which will be cased to provide for pumping for sampling.

b. Further Attempts Should Be Made to Separate the Toxic Substances.

The entire purpose of the investigation is to identify the

Asst for Mr.

NPCochran/eh/451
17 Sept. 1957

CMLMC-RM-OI
SUBJECT: Evaluation of Investigations on Ground Water Contamination Problem

toxic substances present in Mr. Powers' well. We consider the suggestion to continue further attempts to be a self-evident observation, since this Headquarters has not indicated that we propose to discontinue our investigations. Your attention is directed to the fact that this contract has approximately ten (10) months yet to run, and the effort expended month by month has been consistent with the money ($27,000) and the time (two years) allotted for performance of the contract.

c. Chemical Phase Needs to Be Closely Integrated With the Biological Phase:

The Project Officer is of the opinion that these phases of the investigation have been and are being closely integrated, and in addition, geological aspects of the investigation have been integrated into the over-all problem. We are of the opinion that Dr. Bonde's tests are sufficiently precise to determine differences of toxicity of the order existing throughout the ground water area in question.

d. Variation of Symptoms as a Result of Environment:

Environmental conditions are being considered by Dr. Bonde in his evaluation of weekly tests of water samples from all wells sampled.

5. In accordance with Paragraph 7, of referenced letter, it is requested that you supply this Headquarters with duplicate, monthly letter reports of your investigations of the water samples which have been supplied, as indicated above.

FOR THE COMMANDER:

Copy furnished:
CCCml0, Wash 25,D. C.
Attn: Mr. Irving B. Morgan

N. H. CRAMDELL
Major CmlC
Assistant for Manufacturing

Concurrence:

NEAL P. COCHRAN
Chief Indus Engr Div

Copy furnished:
Asst for Mfg

CMLMC-RM-OI

17 SEP 1957

SUBJECT: Letter of Inquiry, Contract No. DA-05-021-401-CML-10,092

Dr. Erik K. Bonde
Department of Biology
University of Colorado
Boulder, Colorado

Dear Erik:

I have reviewed the letter addressed to you by Mr. Cody, representing Monson Brothers. I am of the opinion that any advice you care to offer Mr. Cody, in your capacity as a staff member of the University of Colorado, is not of concern or interest to the Government.

Any information which you may supply, however, which is connected with research performed under the terms of the above contract cannot be divulged without prior approval of this office.

We do not believe that we should dictate an opinion as to the results of your work to date but would agree to your releasing certain of these results if they correspond, in general, to our present opinion.

We are of the opinion that your work to date has indicated that the source of contamination of the ground water underlying the area northwest of Rocky Mountain Arsenal is obscure, and that strong indications have been obtained that the source is not Rocky Mountain Arsenal. We feel that your work has not indicated any appreciable improvement of ground water treated with anhydrous ammonia and believe that such treatment of the ground water is not indicated as a remedy for the situation. Your tests with dilute Powers' water would suggest that Mr. Bright's idea of mixing ground and river water is undesirable and perhaps useless. Your recent tests indicate that the quality of ground water in the area is improving, and this would in-turn suggest that a portion of the difficulty in this area has resulted from our five years of drought.

Should you require any additional information, please do not hesitate

Asst for Mfg

NPCochran/eb/451
7 Sept 1957

CMLMC-RM-OI
SUBJECT: Letter of Inquiry, Contract No. DA-05-021-401-CML-10,092

to contact the undersigned who would be glad to review any answer you prepare prior to sending it to Mr. Cody.

NEAL P. COCHRAN
Project Officer

1 Incl:
Ltr f/RJCody, dtd
15 July 1957

Copy furnished:

CO, CmlC Engr Command, ACC, Md
Attn: Dep for Engr
CO, CMLC, MatCom, ACC, Md
Attn: Mr. Dave Falck

COPY

HOWARD ROKPNACK
Lawyer
770 W. 57th Ave.
Arvada, Colorado

15 July 1957

Director
Botony & Pathology Department
University of Colorado
Boulder, Colorado

Re: Monson Bros.

Dear Sir:

Please be advised that we have been retained by Monson Bros., of Henderson, Colorado, concerning crop damage, the same the possible result of contamination. We have been advised by Mr. Robert R. Bright, Legal Advisor, Headquarters, Army Chemical Center and Mr. P. B. Smith, General Agriculturist, Great Western Sugar Company, that you are presently conducting research into the cause and/or causes of such contamination and that you are attempting to isolate the chemical constituents found in the underground water which are injurious to crops. For that reason we address this letter.

Our problem is of course to first find a way to deal with that contamination which is already present and secondly, to ascertain the cause and/or causes and negate them. We have been advised that the application of anlydnous ammonia under pressure to the ground water might possibly alleviate this situation. Mr. Bright suggests mixing ground and river water early in the season might condition crops for ground water after the exhaustion of river water. Your comments and suggestions to the above would be appreciated. We would also appreciate hearing from you as to any observations you feel at liberty to disclose.

Please address your reply to the attention of the undersigned.

Very truly yours,

/s/Raymond J. Cody
/t/RAYMOND J. CODY

RJC:rr

UNIVERSITY OF COLORADO
BOULDER, COLORADO
July 17, 1957

Dear Neal,

Will you please advise me as to how you would like me to answer the closed letter?

Yours sincerely,

/s/Erik K. Bonde

COPY

NP Cochran/je/532
10 September 1957

CMLMC-RM-OI

SUBJECT: Contract No. DA-05-021-401-CML 10,092

Dr. Theodore Walker
Professor of Geology
University of Colorado
Boulder, Colorado

Dear Sir:

The following information confirms our telephone conversation of 6 September 1957.

Of Wells No. 2-67-10 ccdl and 2-67-10 cddl, the latter is correct. Of Wells No. 2-67-15 cdbl and 2-67-15 cbdl, the latter is correct. The locations for Wells No. 2-67-11 ccdl, 2-67-27 baal and 2-67-27 dddl are correct. Well No. 3-67-6 cccl should be 3-66-6 cccl. Well No. 3-66-6 cccl is located correctly.

The enclosed map gives the water and bedrock elevations of the four (4) new wells drilled by the Corps of Engineers. They seem to be in disagreement with the U.S.G.S. bedrock elevations for these locations.

Chemical analyses for Well No. 2 are as follows: Chlorides-2,428 ppm, fluorides-3ppm and total solids-5,091 ppm.

Yours truly,

NEAL P. COCHRAN
Project Officer

Copy furnished:
CO, CmlC Engr Command, ACC, Md.
Attn: Dep for Engr
CO, CmlC MatCom, ACC, Md.
Attn: Mr. Dave Falck

1 Incl:
a/s

Copy furnished:
CO, RMA
Asst for Mfg

ASST FOR MFG

4547

C
O
P
Y

Tlephone Conversation

13 Aug 57
1100

From: Col W. A. Johnson

To: Col C. B. Drennon, Deputy Comdr, Hq ACC & MatCom

1. Colonel Johnson stated that before he went into the matter he was calling about, he would like to ask if Colonel Drennon would please make a check on the status of the request for renewal of category by our Lt. Wm A. Moore, Service Nr 04044887. Col Johnson advised that Lt Moore put in for Regular Army and has not heard from that, so he submitted a request for extension of category until the matter was determined. Col Drennon stated he was going to Washington tomorrow and will check into this matter.

2. Col Johnson stated that the other point he had to discuss was in connection with a complaint a couple of weeks ago about the smell coming off our sealed lake - the matter hit the columns of the local newspapers. Col Johnson advised that we received a TWX late yesterday afternoon from the Legislative Liaison Branch, symbol SACLL. He further advised that we sent a reply direct to SACLL, priority message, today, with a copy to OCCml0 and MatCom. Col Johnson stated that we have no idea what stirred up this inquiry, so we thought we should notify MatCom immediately and have them tell someone in the Chief's Office. Col Johnson read our reply to DA, and Col Drennon had his secretary take it down.

3. Col Johnson advised Col Drennon that Col Weirich would be back East on leave next week and would stop in to see him.

WAJ

Cy furnished:
Adjutant
Tech Liaison O

CMLMC-RM-OI

Report of Trip to Omaha Corps of Engineers, Omaha District, Omaha, Nebr., 1 & 2 July, by Mr. Cochran and Mr. Donnelly.

Asst for Manufacturing
Executive Officer
Comptroller
IN TURN

Chief, Ind Engr Div

10 July 1957
NPCochran/pw/532

1. Authority

A. CMLMC-RM-AA-60, 28 June 1957

B. Date of departure: 1 July 1957

C. Date of return: 2 July 1957

2. Purpose of Trip

To discuss location for a series of test wells to be drilled on Rocky Mountain Arsenal.

3. Names of Persons Contacted

Mr. Sisko, Omaha Dist. Corps of Engineers
Mr. Hipp, Omaha Dist. Corps of Engineers

4. Discussion

It was agreed that approximately 30 to 45 wells would be drilled approximately as shown on the attached sheet. In addition, 1 to 3 wells will be located in multiples and drilled to varying depths to determine whether any stratification exists in the under ground water table and 3 to 4 wells will be equipped with 2 inch piezometer tubes to provide for drawdown tests to determine underground water flows. Omaha District indicated, drilling could be undertaken as soon as the plastic pipe well casing had been procured.

5. Action to be Taken:

a. An RMA truck will be fitted out to provide power for pumping the wells.

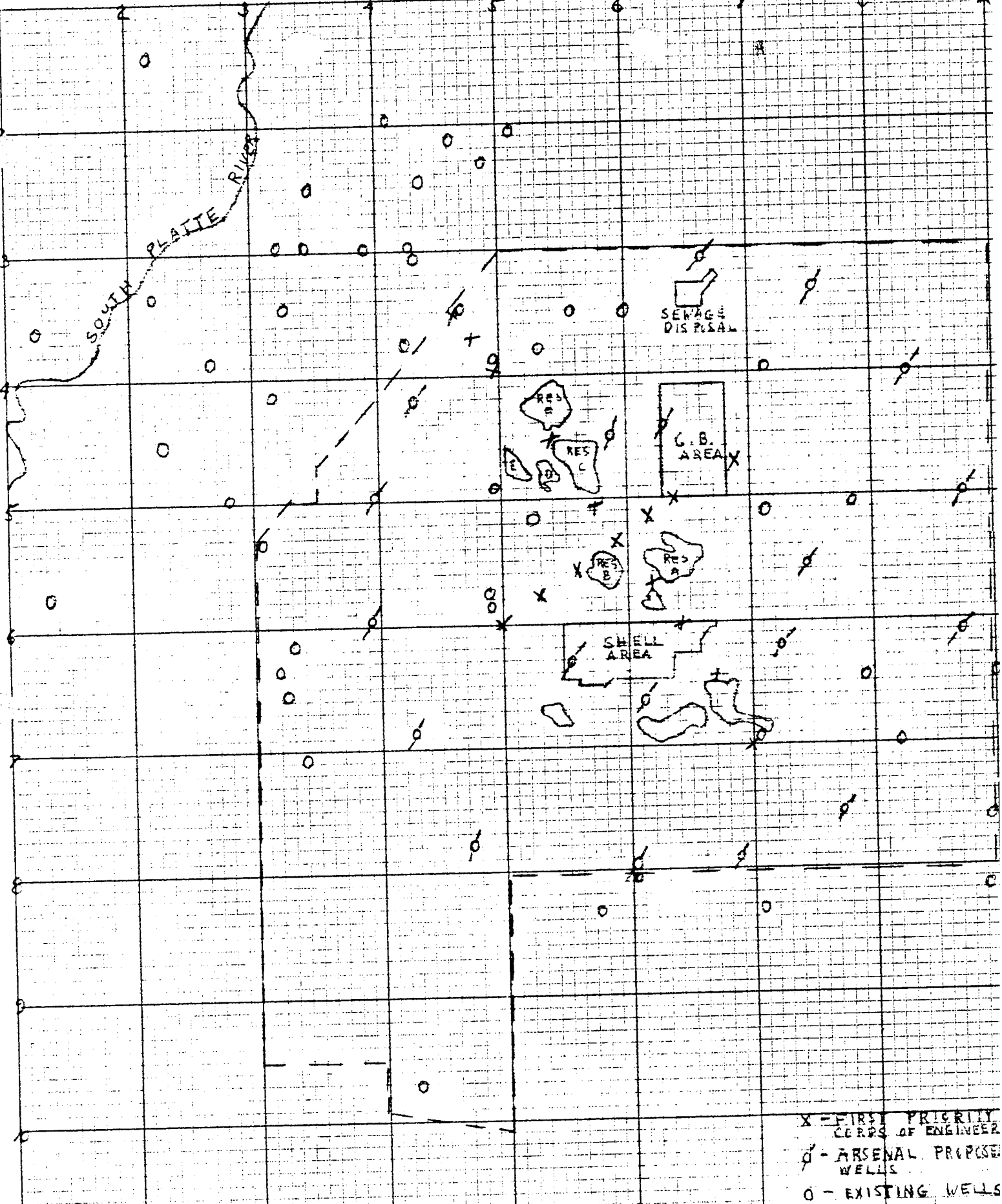
b. Funds will be requested to provide for sampling of the wells.

c. Procedure for sampling and running drawdown tests will be written.

NEAL P. COCHRAN
Chief, Ind Engr Div

List:
D. Falck
Asst for Mfg
Fac. Engr

ENCOM-Dep for Engr
I. B. Morgan


SOUTH PLATTE RIVER
SEWAGE DISPOSAL
RES E
RES C
RES D
C.B. AREA
RES B
RES A
SHELL AREA
X - FIRST PRIORITY CORPS OF ENGINEER
⌀ - ARSENAL PROPOSED WELLS
0 - EXISTING WELLS

C
O
P
Y

17 May 1957

Telephone Conversation

From: Maj W. G. Heslin, Ind Div, Mat Com

To: Col Grothaus

Maj Heslin advised that the Corps is getting a substantial amount of money, as Col Grothaus probably knew. Col Grothaus said the last time he talked to Col Merrill he said there was a rumor that we have a substantial amount of money coming.

Maj Heslin stated that the latest high level information on the CBR School is that it is down the drain. General O'Neill killed it.

Col Grothaus inquired as to Maj Coburn's status and Maj Heslin said he would ask Burger.

Maj Heslin stated that he had jumped on the people in General Currie's office. We had given them $160,000 of our M&O money to modify some buildings at Dugway. Since the School is now out, perhaps we can get this money back and redistribute it. The major question he had was that they have some projects in MatCom from Donnelly. He asked if Col Grothaus would just as soon go ahead and accomplish these projects this year or buy a couple of road graders and not have so many projects. There is available for the Corps $700,000 for heavy equipment but the money probably won't come out in time to buy heavy equipment for the next snow storm. He asked if we want to buy the heavy equipment now and knock out some small projects. $80,000 is available and the road graders cost about $23,000. Col Grothaus said Mr. Donnelly says we better take the road graders because the difference between that and what money they have is about all we can spend anyway. So, Col Grothaus asked Maj Heslin to get us the road graders and then the projects in their order of priority.

Col Grothaus explained that when he talked to Maj Heslin the other day he was disturbed about something that Alberding had told Donnelly - he wasn't talking about Maj Heslin's shop. He was interested that this discussion of charges to overhead not get started all over again. He said he told Col Merrill to get Alberding out of his business.

Heslin said on the sealed lake, he thought we were going to repair the rupture out of money presently on hand and put a PPFF in for the rip rap. Maj Heslin stated that he talked to the Chief's office on the PPFF request on the rip rap and the Chief's office says if we put a red tag on it, they can probably get it through in about a month.

DGG

Copies to: Asst for Mfg
Fac Engr Div
Compt

3175

CMLMC-RM-OIM

Evaporation From Sealed Lake

Chlorine Plant Mgr
Thru: Chief, Indus Engr. Div.
Thru: Asst for Mfg

Chf. Proc. & Meth. Br. 26 Mar 57
RESimmons/eh/6171

Reference: DF on above subject as of 20 Feb. 1957.

1. Discussions with persons concerned with this determination since the issuance of the referenced DF have brought out the following facts:

a. It would be very difficult for the plant to compute the amount of effluent they discharge into the contaminated sewer.

b. Installing a meter in the line would not be practical due to the high acidity of the effluent from the chlorine plant. The effluent would rapidly corrode and destroy any meter made of common materials.

2. This DF rescinds the one dated 20 February 1957.

3. The requirement, to determine the amount of effluent being discharged into the contaminated sewer by the chlorine plant, will be determined by subtracting the flow from the GB and Shell plants from the total flow.

4. The figure thus obtained will not be completely accurate due to the fact that it will contain what is discharged by the WP and Incendiary Plants. It appears that this is the most practical way of determining the discharge from the chlorine plant.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Br.

Asst for Mfg.

Engineering and Development

1791

1st copy

CMLMC-PM-OI (16 Aug 1957)
SUBJECT: Waste Disposal-RMA

1st Ind

NP Cochran/je/532
11 September 1957

13 SEP 1957

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Commanding Officer, U. S. Army Chemical Center and Chemical Corps Materiel Command, Army Chemical Center, Maryland. ATTN: Chief, Industrial Division, CMLAM-M-ZP-42

1. The monthly reports of Contract No. DA 05-021-CML-10,092, Research on Phytotoxic Materials for the months of June and July 1957, were held up due to Mr. Cochran's being on TDY. These reports have now been distributed.

2. Due to a break in the lining of the sealed lake on 21-22 April 1957, the contents of said lake, above the break, were pumped to the adjoining reservoir and back again after the break was repaired, thus making it impossible to obtain a rate of evaporation during the period of May through August. No material was pumped to the sealed lake during this period, therefore, no monthly waste disposal reports were prepared for these months.

3. The monthly Waste Disposal Report for April 1957 is enclosed.

FOR THE COMMANDER:

1 Incl:
a/s

N. HO CRANDELL
Major, Cml C
Assistant for Manufacturing

Copy 1 furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

Incl 1 - As Listed Above
REMOVED. PROTECTIVE MARKINGS WILL BE CANCELLED.

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 APRIL THROUGH 30 APRIL 1957

[redacted]

1. LIQUID WASTE TO DITCHAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, facility 1727, which is pumped to the sealed lake was metered at 1,350,000 Gallons (30 GH) during the month of April.

2. Analysis of Effluent

Component	15 April 1957	2 May 1957
a. Chloride ion (ppm)	981	1010
b. Fluoride ion (ppm)	26	21
c. Phosphorus ion (ppm)	203	218
d. pH	12.5	5.8

B. From Shell Chemical Activities

1. Effluent from the Shell Chemical Plant to the sealed lake totaled 3,744,000 (103 GH) during the month of April.

2. Analysis of Effluent

Component	15 April 1957	2 May 1957
a. Sulfate ion (ppm)	530	11
b. Acetate ion (ppm)	0.25	500
c. Chloride ion (ppm)	1970	9316
d. pH	11.7	1.0

C. From Chlorine Plant

Chlorine effluent to the sealed lake for the month of April is 2,000,000 (60 GH).

D. Flow from Lake A

1. Effluent from Lake A to the sealed lake totaled 13,000,000 gallons for the month of April.

[redacted]

Grad

2. Analysis of Effluent

Component	15 April 1957	2 May 1957
a. Chloride ion (ppm)	513	5359
b. Fluoride ion (ppm)	14	30
c. Phosphoric ion (ppm)	212	1027
d. pH	1.7	5.8

B. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at end of month = 73.3 acres
" " " beginning of month = 70.0 acres

Total 143.6 acres

Mean Area = $\frac{143.6}{2}$ = 74.3 acres

2. Precipitation entering lake

Total precipitation = 74.3 (Mean area of lake, acres)(precipitation, ft.) .300
325,829 (Gal/acre ft)

Total precipitation = Gal. 7,470,000

3. Total change in volume

Elevation of lake end of month = 5195.55 ft.
" " " beginning of month = 5194.71 ft.
Change in elevation = .84 ft.

Total volume change of lake = Vol. at 5,95.55-Vol. at 5191.71
" " " " " =
20,760,000 Gal.

120,190,000
- 99,430,000
20,760,000

4. Evaporation

Total liquid entering lake = effluent flow + precipitation
" " " = gal. 27,644,000
Total liquid entering lake = hal. 27,644,000
= Total change in volume = gal. 20,760,000
Evaporation = gal. 6,884,000
2

[redacted]

4. Evaporation (continued)

Evaporation = (Cal/month) 6,824,640 x Cal/min/acre x 2.03
(Mean acre) (min/month)

(74.3) 34,600 min/24 days

II. LOCAL ACTIVITIES

A. Status of Lake Drainage

The draining of Lake A continued until 23 April 1957 at which time it was shut off because of the discovery of a break in the seal of the sealed lake at the water line. Because of exceedingly heavy rains, it is estimated the capacity of the sealed lake is approximately 40 to 50 million gallons.

B. Status of Sealed Lake

1. The estimated quantity of water in the lake as of 23 April was approximately 105,000,000 gallons.

2. Immediately after the seal was found broken, plans were started to repair the damage. This necessitated setting up pumps to lower the water level approximately two feet. This is being done by pumping the water into Lake C. Since the damage was caused by wave action, plans are also being made to riprap the sealed lake so that this condition will not happen again.

C. The following are the elevations above sea level of water in wells from measurements taken each week for the last five weeks.

Well Number	11 April 1957	18 April 1957	25 April 1957	2 May 1957
2-67-3ccc1	5028.3	5028.2	5028.0	5028.2
2cdc1	5038.4	5038.4	5038.2	5038.1
9cdd1	5037.3	5037.3	5037.2	5037.5
9dbb1	5041.0	5041.0	5041.0	5041.1
10cba2	5032.9	5032.9	5032.9	5032.9
10bdb1	5033.5	5033.5	5033.6	5033.6
10cbd1	5037.3	5037.3	5037.3	5037.3
10cdd1	5033.4	5033.4	5033.3	5033.3
11bcc1	5045.3	5045.3	5045.2	5045.1
11ccd1	5049.2	5049.2	5049.2	5049.2
12cbd1	5103.5	5103.4	5103.4	5103.4
16bdd3	5054.0	5054.1	5054.1	5054.1
16ccd2	5064.8	5064.9	5066.0	5064.9
16ddd2	5070.1	5070.1	5070.2	5070.2
15cdb1	5064.0	5064.1	5064.0	5064.1

[redacted]

c. (Continued)

USGS Well Number	READING 11 April 1957	READING 18 April 1957	READING 25 April 1957	READING 2 May 1957
15dabl	5066.4	5066.4	5066.4	5066.5
15bdcl	5060.9	5060.8	--	--
22ddcl	5149.2	5149.1	5149.1	5149.1
23aaal	5140.5	5140.5	5140.4	5140.4
23ccal	--	5147.3	5147.6	5147.6
23cddl	5146.2	5146.3	5146.3	5146.3
24bddl	--	5147.6	5147.5	5147.1
27baal	5063.4	5063.4	--	--
27dddl	5138.7	5139.2	5139.1	5139.0
33bcbl	5106.8	5106.8	5106.8	5106.8

[redacted]

Ind
Bay 2 16

MEMORANDUM FOR RECORD 7 January 1957

SUBJECT: Contaminated Water Problem

1. Reference is made to my memorandum, subject as above, dated 20 December 1956.

2. A visit similar to the one described in referenced memorandum was made by a group of farmers representing the West Adams Soil Conservation District on 27 December. Personnel attending the conference were as follows:

Representing RMA	Representing West Adams Soil Conservation Dist.	
Col Grothaus	Mr. James E. Fry, Jr.	Mr. William McCordle
Col Johnson	Mr. Charles Davies	Mr. Pete Dilsaver
Lt Col Gay	Mr. Jesse E. Powers	Mr. William Sheehan
Mr. Donnelly	Mr. James L. Johnson	
Mr. Cochran	Mr. Robert Sakata	

3. The subject matter covered was substantially the same as in the case of the earlier visit. Significant points of difference are:

a. A ten-minute colored film on techniques employed in the building of the sealed lake was shown to the group in the conference room in Building 111.

b. Mr. Sakata mentioned the case of a Mr. Tashiro, a cantaloupe grower, who had adverse effects from irrigation water used on cantaloupes. Water came from a well, the significant point being that this well is located south of the area previously in question and in an area in which representatives of Colorado University had not been able previously to discover crop damage.

c. Reference was made at the conference by one of the farmers, Mr. James Johnson, to a meeting which had been held with Governor Johnson sometime ago in which they had asked the State for help in their problem. The Governor is reputed to have stated that there was nothing anyone could do for them, that it was up to the Federal Government and that Rocky Mountain Arsenal was at fault.

4. As in previous conferences an attempt was made to get the point across that there was much that wasn't known about the water situation. The group seemed to recognize this and seemed to be well impressed. I made the statement that when we had anything significant in the development of the water program, we would inform them as we had in this instance. The next foreseeable event appears to be results from the Colorado University contract.

7 January 1957

Memorandum for Record
Subject: Contaminated Water Problem

5. After the conference it was suggested by Mr. Cochran that it might be well to invite a representative of the West Adams Soil Conservation District to visit Colorado University during one of our routine visits so that he might see for himself the effect of water from the various wells on plant life in an experimental situation. I think it might be better to invite a Great Western Sugar Company representative. This last suggestion will be discussed with OCCmlO and Mat Com before any action is taken.

D. C. GROTHAUS
Colonel, Cml C
Commanding

Copies to:
Asst for Mfg
Legal Advisor
Mr. Cochran
Col Lough, OCCmlO
Col Merrill, Mat Com

CMLMC-RM-OE

Water Meters in GB Area

Chief, Production Division
Thru: Asst for Manufacturing

Chief, Facility Engr Div

20 February 57
EZeorian/ag/6022

1. The requirement for recording the process and potable water usage by shift at each building in the GB Area is no longer required. A daily record of the liquid leaving the Chemical Sewer, Facility 1727, and the water transferred from the Process Water System to the Sanitary Sewer in Building 1703 should be maintained.

2. The reading of the meters every eight hours and the maintenance required to keep the units recording properly should be discontinued. If a restriction in flow is experienced, the meter or its nutating disk may be removed to obtain satisfactory flow. The two meters on the Chemical Sewer and Process Water System shall be kept in satisfactory operating condition.

3. A weekly report should be made to the Facility Engineering Office showing the amount of liquid pumped to the sealed lake and also the amount of process water metered to the Sanitary Sewer.

GEORGE F. DONNELLY
Chief, Facility Engineering Div

CMLMC-RM-OIM Evaporation from Sealed Lake

: Facilities Engr Br Chf Proc & Meth Br 20 Feb 57
RESimmons/eh/6171

Thru: Chief Indus Engr Div

Thru: Asst for Mfg

1. It is requested that Facilities Engineering Branch report the following information to Industrial Process and Methods Branch on a DF by the 5th of each month for the previous month:

a. Elevation of water in the sealed lake.

b. Surface area of the lake at a point half-way between the elevation of the water in the sealed lake on the first of the previous month and the first of the current month.

c. The flow from the contaminated lake to the sealed lake.

d. Total precipitation for the previous month.

e. Mean temperature for each day of the previous month.

f. % relative humidity for each day of the previous month.

g. Wind speed and direction for each day of the previous month.

2. It is requested that the Shell Chemical Company read the meter, metering the effluent that flows from their plant into the contaminated sewer, on the first of each month and report this reading to the Industrial Process and Methods Branch.

Asst for Mfg

A. W. SPIGARELLI
Capt. CmlC
Chief, Process and Methods Branch

CMLMC-RM-OIM

: GB Plant Manager
Thru: Chf Indus Engr Div
Thru: Asst for Mfg

Evaporation from Sealed Lake

Chf. Proc & Meth Br

20 Feb 57
RESimmons/eh/6171

1. It is requested that you have the meter, metering the effluent from the GB Plant into the contaminated sewer read on the first of each month and report this reading by DF to the Industrial Process and Methods Branch.

2. It is further requested that the samples of effluent from the GB Plant, the Chlorine Plant and the Shell Chemical Company, which will be delivered to the GB Plant laboratory on the 15th and 30th of each month, be analyzed and the results of this analysis be reported to the Industrial Process and Methods Branch by DF on the 5th of the following month.

3. The GB Plant effluent is to be analyzed for the following:

a. Chloride

b. Flouride

c. Phosphorus ions

d. PH

4. The Shell Chemical Company plant effluent is to be analyzed for:

a. Sulfate

b. Acetate

c. Chloride ions

d. PH

5. The Chlorine Plant effluent is to be analyzed for:

a. Chloride

b. Flouride

c. Phosphorus ions

d. PH

Asst for Mfg

SUBJECT: Evaporation from Sealed Lake

6. That the GB Plant laboratory furnish bottles to the Maintenance Division for collecting these samples.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process and Methods Br.

CMLMC-RM-OIM

Evaporation from Sealed Lake

: Chief Maint Div
Thru: Chief Indus Engr
Thru: Asst for Mfg

Chf Proc. & Meth Br

20 Feb 1957
RESimmons/eh/6171

1. It is requested that the Maintenance Branch perform the following duties in connection with evaporation studies of the sealed lake:

a. On the first and fifteenth of each month the Maintenance Division will collect samples from the following places and deliver them to the GB Plant Laboratory.

(1) Shell Chemical Plant effluent

(2) GB Plant effluent

(3) Chlorine Plant effluent

2. Bottles for collecting these samples will be obtained from the GB Plant Laboratory.

Asst for Mfg

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Br.

1677

CMLMC-RM-OIM

Evaporation from Sealed Lake

: Mgr. Chlorine Plant
Thru: Chf Indus Engr Div
Thru: Asst for Mfg

Chf. Proc & Meth Br

20 Feb 57
RESimmons/eh/6171

1. It is requested that the Chlorine Plant determine the amount of effluent they discharge into the contaminated sewer each month and report this figure on a DF to Industrial Process and Methods Branch.

2. The above report is to be submitted by the fifth of the following month.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Branch

Asst for Mfg

1076

CMLMC-RM-CI
Manager, GB Plant
THRU: Asst for Mfg
THRU: Production Div

Analysis of WaterSamples
Chief, Ind Engr Div

25 Jan 1957
Capt.Friar/djb/451

1. It is requested that water analysis of GB and shell effluent samples be performed by the GB lab. These samples will be brought to the lab twice every month.

2. The shell effluent will be analyzed for:

a. Sulfate ppm
b. Acetate ppm
c. Chloride ppm
d. pH

3. The GB effluent will be analyzed for:

a. Chloride ppm
b. Fluoride ppm
c. Phosphorus ppm
d. pH

4. The above analyses are required by Materiel Command for inclusion in the Monthly Production Report.

Asst for Mfg

CLYDE L. FRIAR
Captain, Cml C
Chief, Ind Engr Div

C
O
P
Y

MEMORANDUM FOR RECORD 7 January 1957

SUBJECT: Contaminated Water Problem

1. Reference is made to my memorandum, subject as above, dated 20 December 1956.

2. A visit similar to the one described in referenced memorandum was made by a group of farmers representing the West Adams Soil Conservation District on 27 December. Personnel attending the conference were as follows:

Representing RMA	Representing West Adams Soil Conservation Dist.	
Col Grothaus	Mr. James E. Fry, Jr.	Mr. William McCorkle
Col Johnson	Mr. Charles Davies	Mr. Pete Dilsaver
Lt Col Gay	Mr. Jesse E. Powers	Mr. William Sheehan
Mr. Donnelly	Mr. James L. Johnson	
Mr. Cochran	Mr. Robert Sakata	

3. The subject matter covered was substantially the same as in the case of the earlier visit. Significant points of difference are:

a. A ten minute colored film on techniques employed in the building of the sealed lake was shown to the group in the conference room in Building 111.

b. Mr. Sakata mentioned the case of a Mr. Tashiro, a cantaloupe grower, who had adverse effects effects from irrigation water used on cantaloupes. Water came from a well, the significant point being that this well is located south of the area previously known to be affected an in an area in which representatives of Colorado University had not been able previously to discover crop damage.

Memorandum for Record 7 January 1957
Subject: Contaminated Water Problem

c. Reference was made at the conference by one of the farmers, Mr. James Johnson, to a meeting which had been held with Governor Johnson sometime ago in which they had asked the State for help in their problem. The Governor is reputed to have stated that there was nothing anyone could do for them, that it was up to the Federal Government and that Rocky Mountain Arsenal was at fault.

4. As in previous conferences an attempt was made to get the point across that there was much that wasn't known about the water situation. The group seemed to recognize this and seemed to be well impressed. I made the statement that when we had anything significant in the development of the water program, we would inform them as we had in this instance. The next foreseeable event appears to be results from the Colorado University contract.

5. After the conference it was suggested by Mr. Cochran that it might be well to invite a representative of the West Adams Soil Conservation District to visit Colorado University during one of our routine visits so that he might see for himself the effect of the various wells on plant life in an experimental situation. I think it might be better to invite a Great Western Sugar Company representative. This last suggestion will be discussed with OCCmlO and MatCom before any action is taken.

D. G. GROTHAUS
Colonel, Cml C
Commanding

Copies to:
Asst for Mfg
Legal Advisor
Mr. Cochran
Col Lough, OCCmlO
Col Merrill, Mat Com

81338R20
DOCUMENT INCORPORATED INTO 81357R33

WASTE DISPOSAL REPORT, U.S. ARMY CHEMICAL ARSENAL, ROCKY MOUNTAIN ARSENAL,
1 APRIL THROUGH 30 APRIL 1957

1957 SEPTEMBER 13

PSm[illegible]h/eh/451
11 [illegible] 58

81357R33

Original

CMLMC-RM-OIM

12 DEC 1958

SUBJECT: Monthly Waste Disposal Report - 1 November thru 30 November, 1958.

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 November through 30 November 1958.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe)

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg ✓
Facilities Engr

Capt Friar/nlw/451
Jan 1957

CMLRC-PM-O

SUBJECT: Waste Disposal Report

TO: Commanding General
Army Chemical Center and
Chemical Corps Materiel Command
Army Chemical Center, Maryland
Attn: Industrial Division

1. As directed in 1st Indorsement, your headquarters, 2 January 1957, to letter this headquarters, 19 December 1956, Subject: Monthly Arsenal Production Report, the first of a series of monthly waste disposal reports is submitted herewith. The report is prepared in sections as suggested by your headquarters. These are individually identified for ease and segregation.

2. There are several areas where data are not available at this time. However, action has been taken to initiate the various programs and as data become available, these sections will be more completely reported.

3. Two copies of this report are being forwarded to Chemical Corps Engineering Command and five copies are being furnished your headquarters for such distribution as you deem appropriate.

FOR THE COMMANDER:

1 Incl:
Waste Disposal Rpt
(in quint)

JOHN F. GAY
Lt Colonel, Cml C
Assistant for Manufacturing

Cy furnished:
CO, Cml C Eng Cmd
w/2 cys of Incl

[redacted]

CMLMC-RM-OIM

SUBJECT: MONTHLY WASTE DISPOSAL REPORT (1 November-30 November 1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 28,200 gallons during the month of November 1958.

2. Analysis of Effluent

Component	3 Nov 58	19 Nov 58
a. chloride ion (ppm)	261	324
b. phosphorous ion (ppm)	41	50
c. pH	12.1	11.9
d. Total solids	1875	2676
e. fluoride ion (ppm)	60	70

B. From Shell Chemical Activities (Quantative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed lake was 39,010 gallons for the month of November.

2. Analysis of Effluent

Component	3 Nov 58	19 Nov 58
a. Acetate (ppm)	570	516
b. chloride (ppm)	603	766
c. pH	5.7	11.3
d. Total solids	1619	2279

C. Evaporation

1. Surface area (mean) evaporation from sealed lake

Surface area at end of month	82.3
Surface area at beginning of month	81.7
Total	164.0

$$\text{Mean area} \quad \frac{164.0}{2} = 82 \text{ acres}$$

2. Precipitation entering lake

Total precipitation (lake area, acres)
(precipitation ft)(gallons/acre ft)

Total precipitation (.74)(82)(325,829)

Total precipitation = 19,771,303 gallons

CMLMC-RM-OIM
SUBJECT: Monthly Waste Disposal Report (November)

3. Total change in volume

Elevation of lake at end of month 5196.72
Elevation of lake at beginning of month 5196.48
Total volume change of lake 150,920,000 - 144,506,000
Total volume change of lake = 6,414,000 gallons

4. Evaporation

Total liquid entering lake = effluent flow plus ppt.
Total liquid entering lake = 28,200 plus 39,010 plus 19,771,3(
Total liquid entering lake = 19,838,513 gallons

Evaporation = Total entering - total change in volume
Evaporation = 19,838,513 - 6,414,000
Evaporation = 13,424,513 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{Mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{13,424,513 \text{ gal})}{(82.0)(43,200)}$$

Evaporation = 3.8 gal/min/acre

SEALED LAKE TEST

Day of Month Nov. 58	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	45	39	6	SSW	0
2.	44	38	5	SSW	0
3.	46	37	6	SSW	0
4.	24	51	7	SE	0
5.	63	33	11	SSE	.11
6.	86	30	7	WSW	0
7.	36	52	5	ENE	T
8.	25	47	14	S	T
9.	53	45	7	SSW	0
10.	36	49	5	SSW	0
11.	59	39	3	ENE	0
12.	77	30	5	SSW	0
13.	35	45	6	SSW	T
14.	40	44	9	S	0
15.	82	25	3	SE	0
16.	80	27	13	SSW	.02
17.	78	15	5	N	.31
18.	45	25	11	SSW	.05
19.	44	34	6	S	0
20.	52	37	10	NW	0
21.	41	42	9	SSW	0
22.	64	36	10	SW	0
23.	53	50	15	SSW	0
24.	28	43	17	S	0
25.	71	25	10	NE	0
26.	74	12	6	ENE	0
27.	86	15	8	NW	T
28.	54	13	13	S	.25
29.	56	28	9	SSW	0
30.	56	32	14	SSW	0
31.					
TOTAL	1633	1038	255.		.74
AVERAGE	54.4%	34.6	8.5		

RMA-T-491-(12 Mar 1957)

PMSmith/eh/451
26 Nov

CMLMC-RM-OIM

SUBJECT: Monthly Waste Disposal Report (1 Oct thru 31 Oct 1958)

2- DEC 1958

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 October through 31 October 1958.

FOR THE COMMANDER:

1 Incl
a/s (In dupe)

Copy furnished:
Asst for Mfg ✓
Facilities Engr

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

R.N.BODINE

P.M.SMITH

CMLMC-RM-OIM
SUBJECT: Monthly Waste Disposal Report (1 October thru 31 October 1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 20,900 gallons during the month of October 1958.

2. Analysis of Effluent

Component	1 Oct 58	15 Oct 58
a. Chloride ion (ppm)	213	279
b. Phosphorous ion (ppm)	70	90.0
c. pH	12.5	11.8
d. Total solids	-	260.9

B. From Shell Chemical Activities (Quantative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed Lake was 743,260 gallons for the month of October.

2. Analysis of Effluent

Component	1 Oct 58	15 Oct 58
a. Acetate (ppm)	558	390
b. Chloride (ppm)	240	288
c. pH	5.2	5.4
d. Total solids (ppm)	-	1617

C. Evaporation

1. Surface area (mean) evaporation from sealed lake

Surface area at end of month	81.70
Surface area at beginning of month	81.60
Total	163.30

$$\text{Mean area } \frac{163.30}{2} = 81.65 \text{ acres}$$

2. Precipitation entering lake
Total precipitation (lake area, acres)
(precipitation ft)(Gallons/acre ft)

Total precipitation = (81.65)(.03) (325,829)
Total precipitation = 798,128 gallons

SUBJECT: Monthly Waste Disposal Report (Oct cont'd)

3. Total change in volume:

Elevation of lake at end of month 5196.48
Elevation of lake at beginning of month 5196.47

Total volume change of lake = Volume at 5196.48 - Vol. 5196.47
Total volume change of lake = 144,500,800 - 144,239,000
Total volume change of lake = 261,800 gallons

4. Evaporation

Total liquid entering lake = Effluent flow plus precipitation
Total liquid entering lake = 743,260 plus 20,900 plus 798,128
Total liquid entering lake = 1,562,288 gallons

Evaporation = Total entering - total change in volume
Evaporation = 1,562,288 - 261,800
Evaporation = 1,300,488 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{1,300,488}{(81.65)(44,640)}$$

Evaporation = .35 gal/min/acre

SEALED LAKE TEST

Day of Month	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	44	61	10	S	T
2.	47	52	4	NW	.06
3.	53	42	16	SSW	0
4.	57	29	12	SSW	0
5.	55	42	5	NNW	0
6.	57	36	9	SSW	0
7.	56	35	11	SSW	0
8.	65	18	19	W	0
9.	48	46	36	SW	0
10.	40	56	6	SSW	0
11.	52	38	11	SSW	0
12.	57	36	12	SSW	0
13.	58	33	14	SSW	0
14.	58	33	8	SSW	0
15.	55	25	16	SSW	0
16.	57	29	10	SSW	0
17.	48	41	7	WNW	0
18.	54	22	16	SSW	0
19.	60	18	8	S	0
20.	48	22	14	NW	0
21.	45	26	10	W	0
22.	39	35	14	SSW	0
23.	48	10	18	SSW	0
24.	44	20	8	SSW	0
25.	37	62	10	NW	0
26.	41	82	2	SW	.02
27.	35	94	3	NNW	0
28.	40	92	6	N	T
29.	33	92	7	NW	.17
30.	30	86	2	SSW	.12
31.	34	65	4	SSW	0
TOTAL	1495	1382	328		.37
AVERAGE	48.22	44.58	10.58		

RMA-T-491-(12 Mar 1957)

CMLMC-RM-OIM

SUBJECT: Monthly Waste Disposal Report (September 1958)

2 DEC 1958

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 September through 30 September 1958.

FOR THE COMMANDER:

CHARLES M. SHADLE
Major CmlC
Assistant for Manufacturing

1 Incl:
a/s (In dupe)

Copy furnished:
Asst for Mfg
Fac Engr

CMLMC-RM-OIM
SUBJECT: Monthly Waste Disposal Report (1 September thru 30 Sept,1958)

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 30,000 gallons during the month of September.

2. Analysis of Effluent

Component	1 Sept 58	15 Sept 58
a. Chloride ion ppm	252	247
b. Phosphorous ion ppm	101	-
c. pH	12.3	12.1
d. Total solids (ppm)	2814	2283

B. From Shell Chemical Activities (Quantitative and Qualitative)

1. Effluent from the Shell Chemical Plant to the sealed lake was 1,270,090 gallons for the month of September.

2. Analysis of Effluent

Component	1 Sept 58	15 Sept 58
a. Acetate (ppm)	450	576
b. Chloride (ppm)	214	189
c. pH	7.6	7.4
d. Total solids (ppm)	607	747

C. Evaporation

1. Surface area (mean) evaporation from sealed lake.

Surface area at end of month : 81.60
Surface area at beginning of month : 81.60
Total 163.20

Mean area = $\frac{163.20}{2}$ = 81.60 acres

2. Precipitation entering lake

Total precipitation (lake area,acres)
(precipitation, ft)(gallons/acre foot)
Total precipitation : (81.60)(.176) (325,829)
Total precipitation : 4,679,352 gallons

Subject; Monthly Waste Disposal Report (Sept)

3. Total change in volume.

Elevation of lake at end of month = 5196.47
Elevation of lake at beginning of month= 5196.47

Total volume change of lake =Volume at 5196.47 - vol at 5196.47
Total volume change of lake = 145,040,000-145,040,000
Total volume change of lake = 0 gallons

4. Evaporation.

Total liquid entering lake = Effluent flow plus precipitation
Total liquid entering lake = 30,000 plus 1,270,000 plus 4,679,352
Total liquid entering lake = 5,979,442 gallons

Evaporation = Total entering-Total change in volume
Evaporation= 5,979,442 - 0
Evaporation = 5,979,442 gallons

$$\text{Evaporation rate} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation rate} = \frac{5,979,442}{(81.7)\ (43,200)}$$

Evaporative rate = 1.69 gal/min/acre

SEALED LAKE TEST

Day of Month	Temp. at 0800 Hrs.	% Relative Humidity at 0800 Hrs.	Wind Velocity at 0800 Hrs. Knots	Wind Direction at 0800 hrs.	Percip-itation
1.	62	40	10	SSW	0
2.	72	22	12	SSW	0
3.	60	38	4	ESE	0
4.	60	61	6	S	T
5.	66	52	11	SW	T
6.	62	62	9	WSW	T
7.	64	55	5	SSW	0
8.	68	46	4	WSW	0
9.	67	48	12	SSW	0
10.	62	64	9	S	0
11.	66	64	6	W	0
12.	66	51	9	SSW	0
13.	75	41	12	SSW	0
14.	58	60	8	NNE	0
15.	52	59	6	WSW	0
16.	46	72	9	SW	.89
17.	56	44	14	SSW	0
18.	63	40	12	SSW	0
19.	59	47	13	SSW	0
20.	66	26	16	SSW	0
21.	51	55	5	WNW	0
22.	64	34	9	SSW	0
23.	69	30	12	SSW	0
24.	65	31	11	SW	0
25.	48	53	9	S	.5
26.	49	51	7	NNE	.7
27.	46	71	8	SSW	0
28.	55	52	7	SSW	0
29.	62	46	10	SSW	0
30.	37	75	9	E	.03
31.					
TOTAL	1855	1490	274		2.12
AVERAGE	61.83	49.67	9.13		

Lt.Bongiovanni/eh/451
9 Jan 1958

CMLMC-RM-GI

SUBJECT: Monthly Waste Disposal Report — JAN 1958

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 December through 31 December 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe)

N. H. CRANDELL
Major CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg ✓
Fac Engr Div

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL
ROCKY MOUNTAIN ARSENAL
DENVER 2, COLORADO

1 DECEMBER THROUGH 31 DECEMBER 1957

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 781,600 gallons during the month of December.

2. Analysis of Effluent

Component	16 December 1957	1 January 1958
a. Chloride ion (ppm)	144.0	605.1
b. Fluoride ion (ppm)	46.4	287.5
c. Phosphorous ion (ppm)	128.5	126.3
d. pH	11.62	12.4

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to the sealed lake totaled 2,235,000 gallons (50 gpm) during the month of December.

2. Analysis of Effluent

Component	16 December 1957	1 January 1958
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	1932	6064
c. Chloride ion (ppm)	2773	5134
d. pH	7.20	10.8

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month = 80.81 acres
Surface Area at Beginning of Month = 80.74 acres
Total 161.55 acres

Mean Area = $\frac{161.55}{2}$ = 80.77 acres

2. Precipitation Entering Lake

Total Precipitation = (Mean Area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.77)(0.005)(325,829)

Total Precipitation = 133,000 Gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5,196.09
Elevation of Lake at Beginning of Month = 5,196.06

Total Volume Change of Lake = Vol at 5,196.09 - Vol at 5,196.06
Total Volume Change of Lake = 134,093,000 - 133,292,000
Total Volume Change of Lake = 801,000 Gallons

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 2,235,000 + 781,600 + 133,000
Total Liquid Entering Lake = 3,149,600 Gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 3,149,600 - 801,000
Evaporation = 2,348,600 Gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{2,348,600}{(80.77)(44,640)}$$

Evaporation = 0.653 gal/min/acre

Lt RW Bongiovanni/je/451
9 December 1957

CMLMC-RM-OI

SUBJECT: Monthly Waste Disposal Report

12 DEC 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 November through 30 November 1957.

FOR THE COMMANDER:

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

1 Incl:
s/s (In dupe -)

Copy furnished:
Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Industrial
Engineering Division

CONCURRED IN: GEORGE F. DONNELLY
Chief, Facility
Engineering Division

ASST FOR MFG

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL
ROCKY MOUNTAIN ARSENAL
DENVER 2, COLORADO

1 NOVEMBER THROUGH 30 NOVEMBER 1957

LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 394,800 gallons during the month of November.

2. Analysis of Effluent

Component	15 November 1957	2 December 1957
a. Chloride ion (ppm)	127.4	210.6
b. Fluoride ion (ppm)	5.4	27.6
c. Phosphorous ion (ppm)	12.6	25.7
d. pH	11.65	10.8

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to the sealed lake totaled 2,160,000 (50 gpm) gallons during the month of November.

2. Analysis of Effluent

Component	15 November 1957	2 December 1957
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	2984	3886
c. Chloride ion (ppm)	1209	2215
d. pH	7.75	11.3

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month = 80.4 acres
Surface Area at Beginning of Month = 80.2 acres
Total 160.6 acres

Mean Area = $\frac{160.6}{2}$ = 80.3 acres

2. Precipitation Entering Lake

Total Precipitation = (Mean Area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.3)(0.041)(325,829)

Total Precipitation = 1,070,000 Gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5,196.06
Elevation of Lake at Beginning of Month = 5,195.94

Total Volume Change of Lake = Vol at 5,196.06 - Vol at 5,195.94
Total Volume Change of Lake = 130,000,000 - 127,000,000
Total Volume Change of Lake = 3,000,000 Gallons

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 394,800 + 2,160,000 + 1,070,000
Total Liquid Entering Lake = 3,624,800 Gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 3,624,800 - 3,000,000
Evaporation = 624,800 Gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{624,800}{(80.3)(43,200)}$$

Evaporation = 0.18 gal/min/acre

LT RW Bongiovanni/je/451
20 November 1957

CMLMC-RM-OI

SUBJECT: Monthly Waste Disposal Report

21 NOV 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 October through 31 October 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In dupe - FOUO)

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

Copy furnished:
Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Industrial
Engineering Division

CONCURRED IN: GEORGE F. DONNELLY
Chief, Facility
Engineering Division

Incl 1-As listed Above

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 OCTOBER THROUGH 31 OCTOBER 1957

[redacted]

I. LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, Facility 1727, which is pumped to the sealed lake, was metered at 622,600 gallons during the month of October.

2. Analysis of Effluent

Component	15 October 1957	3 November 1957
a. Chloride ion (ppm)	107.0	237.2
b. Fluoride ion (ppm)	2.68	17.4
c. Phosphorous ion (ppm)	Nil	54.6
d. pH	11.19	12.15

B. From Shell Chemical Activities

1. Effluent from the Shell Chemical Plant to the sealed lake totaled 1,340,000 gallons during the month of October.

2. Analysis of Effluent

Component	15 October 1957	3 November 1957
a. Sulfate ion (ppm)	Nil	Nil
b. Acetate ion (ppm)	3348	2705
c. Chloride ion (ppm)	3134	1677
d. pH	11.95	9.8

C. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at End of Month	=	80.2 acres
Surface Area at Beginning of Month	=	80.0 acres
Total		160.2 acres

$$\text{Mean Area} = \frac{160.2}{2} = 80.1 \text{ acres}$$

WASTE DISPOSAL REPORT (Cont'd)

2. Precipitation Entering Lake

Total Precipitation = (Mean area lake, acres)
(Precipitation, ft)(Gallons/acre ft)

Total Precipitation = (80.1)(0.22)(325,829)

Total Precipitation = 5,730,000 gallons

3. Total Change in Volume

Elevation of Lake at End of Month = 5195.94 ft.
Elevation of Lake at Beginning of Month= 5195.82 ft.

Total Volume Change of Lake = Vol at 5195.94 - Vol at 5195.82
Total Volume Change of Lake = 126,000,000 - 125,000,000
Total Volume Change of Lake = 1,000,000

4. Evaporation

Total Liquid Entering Lake = Effluent Flow + Precipitation
Total Liquid Entering Lake = 622,600 + 1,340,000 + 5,730,000
Total Liquid Entering Lake = 7,692,600 gallons

Evaporation = Total Entering - Total Change in Volume
Evaporation = 7,692,600 - 1,000,000
Evaporation = 6,692,600 gallons

$$\text{Evaporation} = \frac{\text{gal/month}}{(\text{mean area})(\text{min/month})}$$

$$\text{Evaporation} = \frac{6,692,600}{(80.1)(44,640)}$$

$$= 1.87 \text{ gal/min/acre}$$

[redacted]

NPC chran/eh/451
ct 57

CMLMC-RM-OI

SUBJECT: Monthly Waste Disposal Report 4 NOV 195

TO: Commanding Officer
U. S. Army Chemical Corps Engineering Command
Army Chemical Center, Maryland

Transmitted herewith is the Waste Disposal Report for this Arsenal covering the period 1 September through 30 September 1957.

FOR THE COMMANDER:

1 Incl:
a/s (in dup-FOUO)

H. H. CRANDELL
Major CmlC
Assistant for Manufacturing

Asst for Mfg

Copy furnished:
✓ Asst for Mfg
Fac Engr Div

SUBMITTED BY: NEAL P. COCHRAN
Chief, Indus Engr Div

CONCURRED IN: George F. Donnelly
Chief, Facility
Engr Div

Encl 1- as listed above

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 September through 30 September 1957

[redacted]

1. LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer facility 1727, which is pumped to the sealed lake was metered at 1,016,500 gallons during the month of September.

2. Analysis of Effluent (ppm)

A.

Date	Total Solids	Nitrate	Fluoride	Chloride	Phosphorous
30 Aug	1318	1.3	3.2	232	7
16 Sept	1099	1.4	1.62	162	4.2

B. From Shell Chemical Activities

1. Effluent from Shell Chemical Plant to sealed lake totaled 4,320,000 (100 gpm) during the month of September.

2. Analysis of Effluent (ppm)

A.

Date	Total Solids	Nitrate	Fluoride	Chloride	Phosphorous
30 Aug	12050	12.7	1.5	1400	11.7
16 Sept	5633	5.1	3.0	1320	6.0

C. From Chlorine Plant

There was no dumping from the Chlorine Plant for the month of September. Operation of the plant has ceased.

D. Flow from Lake A

Lake A has been drained. There was no flow from the lake for September.

E. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at end of month = 79.7 acres
Surface Area at beginning of month = 79.5 acres

Total 159.2 acres

Mean Area = $\frac{159.2}{2}$ = 79.6 acres

2. Precipitation entering lake

Total precipitation = (Mean area lake, acres) (precipitation ft.)(ga/ acre ft)

[redacted]

Total precipitation = 79.6 (0.041) (325,829)

Total precipitation = 1,050,000 gallons

3. Total Change in Volume

Elevation of lake at end of month = 5195.82
Elevation of lake at beginning of month = 5195.78

Total volume change of lake = volume at 5195.82 - volume at 5195.78
Total volume change of lake = 126,590,000 - 125,590,000
= 1,000,000 gallons

4. Evaporation

Total liquid entering lake = effluent flow + precipitation
Total liquid entering lake = 1,016,500 + 4,320,000 + 1,050,000
= 6,386,500
- Total change in volume = 1,000,000

Evaporation = 5,386,500 gallons

$$\text{Evaporation} = \frac{(\text{gal/mo.})}{(\text{Mean acre})(\text{min/mo.})}$$

$$\text{Evaporation} = \frac{5,386,500}{79.6\ (43,200)}$$

= 1.57 gal/min/acre

II. Local Activities

A. Status of lake drainage

Lake A has been drained.

B. Status of Sealed Lake

The sealed lake has been repaired.

C. The following are the elevations above sea level of water in wells from measurements taken each week for the past five weeks:

USGS Well Number	READING 22 Aug 57	READING 29 Aug 57	READING 5 Sept 57	READING 12 Sept.57	READING 19 Sept. 57
2-67-3eccl	5029.3	5029.8	5029.7	5029.3	5029.3
2cdcl	5044.9	5045.2	5045.4	5045.6	5045.5
9cddl	5038.9	5039.1	5038.9	5038.8	5038.7
9ddbl	5043.5	5042.8	5042.2	5042.7	5042.7
10aba2	-	5036.0	5036.5	0	0
10bdbl	5038.9	5038.9	5038.8	5038.7	5038.2
10abdl	5040.5	5040.8	5041.2	5041.6	5041.6
10cddl	5057.6	5058.4	5058.4	5058.4	5058.7
11bccl	5050.6	5051.4	5051.6	5051.8	5051.9
11ccdl	5055.6	5056.3	5056.6	5057.2	5057.2
12abdl	5108.8	5108.9	5108.8	5108.8	5108.8
16bdd3	5056.9	5057.0	5057.0	-	-
16ccd2	5068.0	5068.2	5067.9	-	-
16ddd2	5076.5	5076.6	5076.3	5075.6	5075.5
15cdbl	5070.6	5071.4	5071.1	5070.9	5070.7
15dcbl	5075.3	5075.3	5075.1	5074.9	5070.6
22idcl	5148.6	5148.6	5148.6	5148.6	5148.7
23ccal	5149.0	5149.0	5149.0	5149.1	5149.2
23acel	5147.6	5147.6	5147.5	5147.6	5147.6
23addl	5146.4	5146.2	5145.8	5146.0	5146.0
24bddl	5146.8	5146.7	5146.7	5146.6	5146.5
27baal	5062.0	5062.0	5062.0	5062.0	5062.0
27dddl	5147.7	5147.8	5147.6	5147.9	5147.8
33bcbl	5107.9	5108.1	5108.2	5108.3	5108.4

[redacted]

CMLMC-RM-OI

NP Cochran/je/532
13 December 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim

13 DEC 1957

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Materiel Command
Army Chemical Center, Maryland
ATTN: Mr. David Falck

1. Confirming telephone conversation, 12 December 1957, between Mr. David Falck, your Headquarters, and the undersigned, the following information is forwarded for transmittal to the Office of the Chief Chemical Officer.

WEARE WELL WATER ANALYSIS (ppm)

Sample Date	Total Solids	Fluoride	Chloride	Nitrate	Phosphorous
5 Nov 1957	2446	1.52	--	6.5	7.4
12 Nov 1957	2511	1.40	593	20.1	Nil
19 Nov 1957	2337	1.44	605	12.1	Nil
26 Nov 1957	2324	1.40	622	7.1	Nil
3 Dec 1957	2278	1.36	635	19.3	Nil

2. All the above samples were non-toxic in plant growth tests.

Copy furnished:
CO, US ACmlC Engr Command, ACC, Maryland
Attn: Deputy for Engineering

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN
Project Officer

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

ASST FOR MFG

NP Cochran/je/532
22 November 1957
25 NOV 1957

CMLMC-RM-OI
(8 Nov 1957)
SUBJECT: Request from OTS, Department of Commerce

1st Ind

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Office of the Chief Chemical Officer, Department of the Army, Washington 25, D. C. Attn: Technical Liaison Officer

Previous correspondence on this subject was contained in first indorsement, CMLMC-RM-OI, dated 8 November 1957, to basic letter, CMLWA-T, dated 22 October 1957, same subject. This previous correspondence cited potential claims against the Government and requested clarification of potential release to the general public.

Incl w/d

Copy furnished:
Asst for Mfg

R. L. MARTIN
Colonel, Cml C
Commanding

N. H. CRANDELL, Major, Cml C
Assistant for Manufacturing

NEAL P. COCHRAN, Chief, Industrial Engineering Division

Brief: The Department of Commerce apparently picks up a listing of our Progress Reports from Colorado University off an ASTIA List. In previous correspondence, we have requested permission to withhold the reports pending a statement from the Department of Commerce that they do not propose to release the reports to the general public. This request and our previous correspondence apparently crossed enroute since our indorsement was dated 8 November 1957 and the request from MatCom both the same date.

ASST FOR MFG

NP Cochran/je/532
21 November 1957

CMLMC-RM-OI

22 NOV 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim (Correction)

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Material Command
Army Chemical Center, Maryland
ATTN: Assistant, Industrial Division

1. Reference First Indorsement, CMLMC-RM-OI, dated 19 November 1957, same subject, to basic letter from CMLAM-M-2P-42, dated 28 October 1957.

2. It is requested that the following correction be made to Inclosure 2, Appendix IV: Change date from "12 June to 24 September 1957" to "8 November 1954 to 4 June 1956".

FOR THE COMMANDER:

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

Copy furnished:
CO, US ACmlC Engr Command, ACC, Md
Attn: Deputy for Engineering

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

ASST FOR MFG

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Telephone Conversation 22 Nov 57 - 1000

From: Mr. L. E. Garono, U. S. Army Chemical Corps Engineering Command, ACC, Md

To: Mr. N. P. Cochran, Chief, Industrial Engineering Division, RMA

1. Mr. Garono called in regard to our Status Report, Weare Claim, which was sent as Inclosure 1 to 1st Ind, CMLMC-RM-OI, dated 19 November 1957, Subj: Chemical Corps Responsibility for Damages - Weare Claim. Mr. Garono felt that Paragraph 3.a., Conclusions, was an overstatement of responsibility and that the wordage could be changed to something like, "contributed to" rather than "responsible for".

2. Mr. Cochran agreed and asked if he wished to have the report withdrawn, and he stated, "no", that he thought MatCom would review the report.

3. In addition, Mr. Cochran informed Mr. Garono that we had completed our estimate for the "V" Project, that the total was $4,500,000 and that copies had been forwarded to MatCom.

4. Mr. Cochran confirmed his visit to ACC for purposes of review of the GB Report.

Telephone Conversation 22 November 57 - 1040

From: Mr. D. A. Falck, U. S. Army Chemical Center and CmlC MatCom, ACC, Md

To: Mlr.N. P. Cochran, Chief, Industrial Engineering Division, RMA

1. Mr. Falck called concerning the same subject as above. Mr. Cochran agreed to his changing the next to the last sentence in Paragraph 2.b. from "An analysis of this information reveals that acceptance of responsibility for high salinity eliminates liability for toxic effects." to "An analysis of this information reveals that there is no apparent correlation between high salinity and phytotoxicity.", and Paragraph 3.a. from "Rocky Mountain Arsenal is responsible for high salinity in the ground water northwest of the Arsenal generally as indicated in Appendix II." to "Rocky Mountain Arsenal has contributed to the apparent high salinity in the ground water northwest of the Arsenal generally as indicated in Appendix II."

2. Mr. Falck stated that he would attempt to arrive at one report (Our document indicated above stated 15 January 1958) rather than another report on the Weare Claim in December and a comprehensive report again in January.

3. Mr. Cochran reiterated to Mr. Falck the statements he has made to various people in the past, namely, that the Colorado University Contract is not specific to the Weare Claim and in fact, all organizations and individuals concerned, during the negotiation period, had recommended that it not be specific to or specifically investigate Mr. Weare's Well. On this basis, it is his opinion that we cannot ask Colorado University for a specific statement

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concerning Chemical Corps responsibility for the damages sustained by Mr. Weare. He emphasized this very strongly to Mr. Falck, and stated specifically that the Status Report, which we had supplied, was his opinion and his opinion only.

Copy furnished:
Deputy Commander
Asst for Mfg

NEAL P. COCHRAN
Chief, Industrial
Engineering Division

NP Cochran/je/532
18 November 1957

CMLMC-RM-OI (28 Oct 57) 1st Ind

19 NOV 1957

SUBJECT: Chemical Corps Responsibility for Damages - Weare Claim

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Commanding Officer, U. S. Army Chemical Center and Chemical Corps Materiel Command, Army Chemical Center, Maryland. Attn: Assistant, Industrial Division

1. The Status Report requested in basic communication has been completed and is inclosed.

2. This report indicates that this Arsenal is not liable for the damages sustained by Mr. Weare and recommends so advising the Judge Advocate General. This Headquarters concurs in the recommendation as stated in the attached report.

3. The Colorado University Contract, cited in the inclosed report, is scheduled for completion on or before 31 December 1957, and a more comprehensive report will be issued on or before 15 January 1958.

1 Incl:
w/d 1 Incl - 1
Added 1 Incl
2. Status Rpt (In quadruple)

R. L. MARTIN
Colonel, CmlC
Commanding

Copy furnished:
CO, US ACmlC Engr Command, ACC, Md
Attn: Deputy for Engineering

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief, Industrial Engineering Division

Brief: Report was requested by MatCom to enable Colonel Lough to present legal information to the Chief. MatCom and OCCmlO have been informed of the additional report to be issued later and agree.

ASST FOR MFG

NP Cochran/je/532
7 November 1957

CMLNC-RM-OI

SUBJECT: Plant Growth on Disposal Lake A Bottom

TO: Commanding Officer
U. S. Army Chemical Center and
Chemical Corps Material Command
Army Chemical Center, Maryland
ATTN: Mr. David Falck

1. Forwarded for your information are photographs of plant growth on the Disposal Lake A bottom.

2. Growth of these plants in Lake A soil, which was beneath the surface of the lake for at least five (5) years, does not agree with the University of Colorado findings which showed that soil watered with Powers' water retained its toxicity. This is a strong indication that Lake A is not the source of contamination of the ground water northeast of Rocky Mountain Arsenal.

3 Incls:
Photographs

NEAL P. COCHRAN
Project Officer

Copy furnished:
CO, CmlC Engr Command, ACC, Md
Attn: Dep for Engineering
Office of Chief CmlO, Wash 25, D.C.
Attn: Mr. I. E. Morgan
CO, CmlC BW Labs, Ft. Detrick, Frederick, Md
Attn: Dr. Robert L. Weintraub

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NP Cochran/je/532
7 November 1957

CMLMC-RH-OI (22 Oct 57) 1st Ind

SUBJECT: Request from OTS, Department of Commerce

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Office of the Chief Chemical Officer, Department of the Army, Washington 25, D.C. Attn: Technical Liaison Officer

1. Work under terms of Contract DA-05-021-CML-10,092 has not been completed and is continuing. Progress Reports, to date, contain information which could lead to claims against the Government, and as a result, this Headquarters would recommend that release to the Department of Commerce is not advisable at this time.

2. Progress Reports on the subject contract can be supplied if it is understood that they are not for distribution to the general public.

1 Incl:
w/d

R. L. MARTIN
Colonel, Cml C
Commanding

Copy furnished:
Asst for Mfg

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

NEAL P. COCHRAN, Chief, Industrial Engineering Division

ASST FOR MFG

CL Friar/je/451
14 October 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

16 OCT 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Garono

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 12 October 1957.

FOR THE COMMANDER:

1 Incl:
s/s (In trip)

Copy furnished:
OCCmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan

Copy furnished:
Asst for Mfg

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

Clyde L Friar

CLYDE L. FRIAR, Captain, CmlC
Acting Chief, Indus Engr Division

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 12 October 1957

14 October 1957

1. Progress continues on the Preliminary Report and Request for Authorization which is due the end of October.

2. Mr. J. H. Dolltf of Champlain Oil and Refining Company was consulted. He supplied copies of core analyses and sample descriptions of their well in Section 3-2N-65W. In addition, electric log and test data was made available and generally completed the tabulation of all data possible.

FRANK R. INGRAHAM
Pfc, CmlC

PETER T. LUCAS
Pfc, CmlC

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Telephone Conversation 9 Oct 57 - 1100

From: Mr. Neal P. Cochran, Chief, Industrial Engineering Division, RMA

To: Dr. Robert L. Weintraub, Biological Warfare Labs, Ft. Detrick, Frederick, Maryland

1. Dr. Weintraub is now in charge of the project for RMA water, and Mr. Cochran asked him why we haven't received any copies of the report and the status of what they are doing at Fort Detrick. He stated that a report would be sent within a week or two.

2. Dr. Weintraub stated that they have a satisfactory assay test method and have fractioned residues with several active materials. They are not as far along as the Colorado University people, and he did not see the last two or three reports until recently. Mr. Cochran explained that there had been some delay on them and that the August report was being held up for some corrections to be made by the Colorado University.

3/ The Biological Labs are going over much the same work that the Colorado University has been doing in recent months, and they requested some more water samples. Mr. Cochran stated that the water has been changing and the samples would not be the same as Mr. Powers' Well, which used to be auite toxic, is non-toxic at the moment. Two more carboys of Powers' water and A-49 are to be sent to them.

4. Dr. Arthur Newman has transferred to the Department of Agriculture in Washington, D. C., and their Division is being closed down but will be there for a couple of months.

5. Mr. Cochran stated that any information they wanted from him would be furnished if he has it and that he will call Dr. Weintraub sometime before the first of the year and ask him to come out and look at what the Colorado University is doing, as it will be desirable to exchange ideas.

Copy furnished:
Deputy Commander
Asst for Mfg

NEAL P. COCHRAN
Chief, Industrial
Engineering Division

Classified Received

4817

NP Cochran/je/532
7 October 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

7 - OCT 1957

TO: **Commanding Officer**
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Garono

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 5 October 1957.

FOR THE COMMANDER:

1 Incl:
a/s (In trip)

N. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

Copy furnished:
OCCmlO, Wash 25, D.C.
Attn: Mr. I. B. Morgan

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 5 October 1957

7 October 1957

1. Mr. Glen Scott and Mr. R. H. McLaughlin were contacted at the U. S. Geological Survey in Denver, Colorado, regarding possible zones below the Lakota and Lyons. It appears that the Fountain, the principle formation below the Lyons at a depth of approximately 10,000 feet under Rocky Mountain Arsenal, has a thickness ranging from 400 to 1000 feet. In general, the Fountain is a coarse arkosic sandstone(more than 20% Feldspar; Al, K, Na, Ca, SiO_2) and conglomerate with numerous streaks of red, silty mudstones. It is believed that the amount of clays would be an inhibiting factor to successful disposal.

2. Work continues emphasizing the Lakota sandstone as the most favorable zone for disposal.

a. A structure map of the Lakota in the region has been completed. This shows the Lakota to be at 3470 feet below sea level under the Arsenal.

b. Dowell, Inc., is analyzing a core sample of the sand to determine solubility and stability of the minerals and specifically, the swelling properties of the clays. These results will indicate whether there will be appreciable swelling causing a reduction in permeability. Dowell will then be able to recommend inhibitors, if necessary.

c. Additional information was obtained on fracturing and treating techniques.

d. Schlumberger Well Surveying Corporation supplied log interpretation data and checked the Johnston Well results.

e. Calculations are being made to estimate the injection rate and pressure characteristics of the Lakota formation using the test data from the Johnston Well.

Frank R. Ingraham

FRANK R. INGRAHAM
Pfc, CmlC

Peter T. Lucas

PETER T. LUCAS
Pfc, CmlC

NP Cochran/je/532
30 September 1957

CMLMC-RM-OI

30 SEP 1957

Dr. Erik K. Bonde
Department of Biology
University of Colorado
Boulder, Colorado

Dear Dr. Bonde:

We have received your letter, dated 18 September 1957, and find that your comments to Mr. Cody meet with our approval.

If you should receive any additional correspondence from Mr. Cody, we request that you do not supply any information which is connected with research performed under terms of your contract without prior approval of this office. We will be happy to review any additional correspondence you have with Mr. Cody and will be glad to approve release of information which is not against the best interests of the Government.

Very truly yours,

NEAL P. COCHRAN
Project Officer

1 Incl:
Ltr to R.J. Cody,
dtd 18Sept57

Copy furnished:
Asst for Mfg

N. H. CRANDELL, Major, CmlC
Assistant for Manufacturing

ASST FOR MFG

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UNIVERSITY OF COLORADO

BOULDER, Colorado

DEPARTMENT OF BIOLOGY

Sept. 18, 1957

Mr. Raymond J. Cody
7700 West 57th Avenue
Arvada, Colorado

Dear Mr. Cody:

I and several colleagues have been studying the toxic effects of certain wells near Henderson, Colorado, as you know. We are interested in isolating and identifying the materials responsible for crop damage and in finding ways of preventing the damage. The task of isolating such materials, as would be expected, is proving very difficult, since any one of a large number of substances may be a toxic agent.

Since we have not succeeded in identifying a toxic agent from water samples, I am in no position to give you helpful suggestions at this time. Treatment of water in the laboratory with ammonia has not resulted in alleviation of damaging effects. Dilution of well water with non-toxic water would of course reduce the harmful effects, but a sufficient dilution to avoid damage may not be practical. Recent indications are, however, that the quality of the ground water is greatly improved. This may possibly be a seasonal effect or a more permanent result of increased rainfall.

I shall be glad to transmit to your clients any future information that may be of aid to them in solving their agricultural problems.

Yours sincerely,

Erik K. Bonde
Assistant Professor of Biology

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NP Cochran/je/532
26 September 1957

CMLMC-RM-OI

SUBJECT: Weekly Deep Well Disposal Progress Report

21 SEP 1957

TO: Commanding Officer
U. S. Army Chemical Corps
Engineering Command
Army Chemical Center, Maryland
ATTN: Mr. L. E. Geromo

Transmitted herewith is the Weekly Progress Report on the Deep Well Disposal Project for the week ending 21 September 1957.

FOR THE COMMANDER:

M. H. CRANDELL
Major, CmlC
Assistant for Manufacturing

1 Incl:
a/s (In trip)

Copy furnished:
OCCml0, Wash 25, D.C.
Attn: Mr. I. B. Morgan

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

Copy furnished:
Asst for Mfg

ASST FOR MFG

DEEP WELL DISPOSAL PROJECT

WEEKLY PROGRESS REPORT

Week Ending 21 September 1957

24 September 1957

1. Observation of the Johnston Deep Well, east of Rocky Mountain Arsenal, was maintained with frequent trips out to the well site. The top of the Lyons Sandstone was encountered at approximately 9,435 feet. The well was cored eighteen (18) feet from 9,444 feet to 9,462 feet from which representative samples were obtained. The core samples are being analyzed by Core Labs, Inc. Preliminary results indicated a tight sandstone with much siliceous cementation between the sub-angular, sub-rounded, well sorted sand grains. There was much banding comprised of ferruginous, silty material, uniform in dip approximately 25° - 30°. The well-laminated nature tends to restrict vertical permeability. Tests run on the permeability indicated flow rates of practically nothing. Porosity was less than 5%.

2. On 21 September, the well was abandoned at a total depth of 9,462 feet, finding no commercial hydrocarbon production. Complete final logs and test data will be obtained from the operator in the next few days.

3. During the week, a sample of well water from the Lyons formation, from the Black Hollow Field northeast of Rocky Mountain Arsenal, was analyzed with the following results:

a.	Total Solids	-	31,833 ppm
b.	Cl^-	-	11,650 ppm
c.	NO_3	-	0
d.	F^-	-	2.16
e.	SO_4	-	(To be rechecked)
f.	pH	-	7.5

4. Raw brine, acidized to 10% HCl acid solution, was obtained and is available for testing on any core samples. Cost estimates for special permeability tests were obtained from Core Labs, Inc., to determine water-brine saturation rates. These analyses would include ratio curves comparing permeability of a given core sample with brine as against air.

5. In order to obtain basic quantitative data pertinent to the project, the following persons were contacted by Pfc Lucas:

a. Mr. William Hubbard, Petroleum Engineer, American Metals Company

b. Mr. C. F. Blankenhorn, Reservoir Engineer, Shell Oil Company

c. Mr. J. T. Taylor, Stratigrapher, Shell Oil Company

Arrangements were made with Mr. Taylor to use Shell's files and data on wells surrounding Rocky Mountain Arsenal. Literature on water-flooding techniques was also obtained.

FRANK R. INGRAHAM
Pfc, CmlC

NP Cochran/je/532
23 September 1957

CMLMC-RM-OI (11 Sept 57) 1st Ind

SUBJECT: Information on Water Samples

24 SEP 1957

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado'

TO: Commanding Officer, U. S. Army Biological Warfare Laboratories, Fort Detrick, Frederick, Maryland. Attn: Director of Research

1. Reference is made to basic letter.

2. Monthly Reports on the Colorado University Contract were not forwarded to your Headquarters on schedule as a result of certain reorganizations and "Reduction in Force" on the Arsenal. Reports for June and July were sent on 17 September 1957. The August report has not been received from Colorado University, as of this date, as a result of the vacation period for the Project Head.

3. The water from the Powers' and A-49 Well was sampled on 23 July 1957. Chemical analyses (ppm) of the well waters are as follows:

WELL	DISSOLVED SOLIDS	CHLORIDES	FLUORIDES	NITRATE	PHOSPHOROUS
A-49	6590	2913	4.8	1.0	90.0
Powers	1690	441	Nil	7.0	0.4

4. Enclosed are chemical analyses of water samples since 30 July 1957.

FOR THE COMMANDER:

1 Incl:
a/s

N. H. CRANDELL
Major, Cml C
Assistant for Manufacturing

Copy furnished:
Asst for Mfg

NEAL P. COCHRAN, Chief,
Industrial Engineering Division

ASST FOR MFG

CMLMC-RM-OI

18 SEP 1957

SUBJECT: Evaluation of Investigations on Ground Water Contamination Problem

TO: Commanding Officer
U. S. Army Biological Warfare Laboratories
Fort Detrick
Frederick, Maryland
ATTN: Dr. Arthur S. Newman

1. Reference is made to letter, CMLRD-RM-1C-C, dated 20 June 1957, same subject.

2. In accordance with request, fifty (50) gallon samples of water from Arsenal Well A-49 and Mr. Powers' well were shipped to your Headquarters on 31 July 1957. These samples were shipped in twenty-five (25) gallon acid carboys, as we have found this water reacts with metal drums.

3. Monthly reports on the Colorado University Contract were not forwarded to your Headquarters on schedule as a result of certain reorganizations and "Reductions in Force" on the Arsenal. Reports for June and July were sent on 17 September 1957. The August report has not been received from Colorado University, as of this date, as a result of the vacation period for the Project Head.

4. Paragraph 5 of referenced letter recommended certain actions be considered in the Colorado University investigations including:

a. Pumping of Wells Before Sampling:

All wells which have been sampled that are equipped with pumps are pumped before a sample is taken. Since a number of the wells are not so equipped, this is not always possible. The Corps of Engineers is currently drilling a series of approximately forty (40) wells which will be cased to provide for pumping for sampling.

b. Further Attempts Should Be Made to Separate the Toxic Substances.

The entire purpose of the investigation is to identify the

Asst for Mfg

NPCochran/eh/451
17 Sept. 1957

CMLMC-RM-OI
SUBJECT: Evaluation of Investigations on Ground Water Contamination Problem

toxic substances present in Mr. Powers' well. We consider the suggestion to continue further attempts to be a self-evident observation, since this Headquarters has not indicated that we propose to discontinue our investigations. Your attention is directed to the fact that this contract has approximately ten (10) months yet to run, and the effort expended month by month has been consistent with the money ($27,000) and the time (two years) allotted for performance of the contract.

c. Chemical Phase Needs to Be Closely Integrated With the Biological Phase:

The Project Officer is of the opinion that these phases of the investigation have been and are being closely integrated, and in addition, geological aspects of the investigation have been integrated into the over-all problem. We are of the opinion that Dr. Bonde's tests are sufficiently precise to determine differences of toxicity of the order existing throughout the ground water area in question.

d. Variation of Symptoms as a Result of Environment:

Environmental conditions are being considered by Dr. Bonde in his evaluation of weekly tests of water samples from all wells sampled.

5. In accordance with Paragraph 7, of referenced letter, it is requested that you supply this Headquarters with duplicate, monthly letter reports of your investigations of the water samples which have been supplied, as indicated above.

FOR THE COMMANDER:

N. H. CRANDELL
Major Ord C
Assistant for Manufacturing

Copy furnished:
OCCmlO, Wash 25,D. C.
Attn: Mr. Irving B. Morgan

Concurrence:

NEAL P. COCHRAN
Chief Indus Engr Div

Copy furnished:
Asst for Mfg

CMLMC-RM-OI 17 SEP 1957

SUBJECT: Letter of Inquiry, Contract No. DA-05-021-401-CML-10,092

Dr. Erik K. Bonde
Department of Biology
University of Colorado
Boulder, Colorado

Dear Erik:

I have reviewed the letter addressed to you by Mr. Cody, representing Monson Brothers. I am of the opinion that any advice you care to offer Mr. Cody, in your capacity as a staff member of the University of Colorado, is not of concern or interest to the Government.

Any information which you may supply, however, which is connected with research performed under the terms of the above contract cannot be divulged without prior approval of this office.

We do not believe that we should dictate an opinion as to the results of your work to date but would agree to your releasing certain of these results if they correspond, in general, to our present opinion.

We are of the opinion that your work to date has indicated that the source of contamination of the ground water underlying the area northwest of Rocky Mountain Arsenal is obscure, and that strong indications have been obtained that the source is not Rocky Mountain Arsenal. We feel that your work has not indicated any appreciable improvement of ground water treated with anhydrous ammonia and believe that such treatment of the ground water is not indicated as a remedy for the situation. Your tests with dilute Powers' water would suggest that Mr. Bright's idea of mixing ground and river water is undesirable and perhaps useless. Your recent tests indicate that the quality of ground water in the area is improving, and this would in-turn suggest that a portion of the difficulty in this area has resulted from our five years of drought.

Should you require any additional information, please do not hesitate

Asst for Mfg

NPCochran/eb/451
7 Sept 1957

CMLMC-RM-OI
SUBJECT: Letter of Inquiry, Contract No. DA-05-021-401-CML-10,092

to contact the undersigned who would be glad to review any answer you prepare prior to sending it to Mr. Cody.

NEAL P. COCHRAN
Project Officer

1 Incl:
Ltr f/RJCody, dtd
15 July 1957

Copy furnished:

CO, CmlC Engr Command, ACC, Md
Attn: Dep for Engr
CO, CMLC, MatCom, ACC, Md
Attn: Mr. Dave Falck

HOWARD ROEPNACK
Lawyer
770 W. 57th Ave.
Arvada, Colorado

15 July 1957

Director
Botony & Pathology Department
University of Colorado
Boulder, Colorado

Re: Monson Bros.

Dear Sir:

Please be advised that we have been retained by Monson Bros., of Henderson, Colorado, concerning crop damage, the same the possible result of contamination. We have been advised by Mr. Robert R. Bright, Legal Advisor, Headquarters, Army Chemical Center and Mr. P. B. Smith, General Agriculturist, Great Western Sugar Company, that you are presently conducting research into the cause and/or causes of such contamination and that you are attempting to isolate the chemical constituents found in the underground water which are injurious to crops. For that reason we address this letter.

Our problem is of course to first find a way to deal with that contamination which is already present and secondly, to ascertain the cause and/or causes and negate them. We have been advised that the application of anlydnous ammonia under pressure to the ground water might possibly alleviate this situation. Mr. Bright suggests mixing ground and river water early in the season might condition crops for ground water after the exhaustion of river water. Your comments and suggestions to the above would be appreciated. We would also appreciate hearing from you as to any observations you feel at liberty to disclose.

Please address your reply to the attention of the undersigned.

Very truly yours,

/s/Raymond J. Cody
/t/RAYMOND J. CODY

RJC:rr

UNIVERSITY OF COLORADO
BOULDER, COLORADO
July 17, 1957

Dear Neal,

Will you please advise me as to how you would like me to answer the closed letter?

Yours sincerely,

/s/Erik K. Bonde

NP Cochran/je/532
10 September 1957

CMLMC-RM-OI

SUBJECT: Contract No. DA-05-021-401-CML 10,092

Dr. Theodore Walker
Professor of Geology
University of Colorado
Boulder, Colorado

11 SEP 1957

Dear Sir:

The following information confirms our telephone conversation of 6 September 1957.

Of Wells No. 2-67-10 ccdl and 2-67-10 cddl, the latter is correct. Of Wells No. 2-67-15 cdbl and 2-67-15 cbdl, the latter is correct. The locations for Wells No. 2-67-11 ccdl, 2-67-27 baal and 2-67-27 dddl are correct. Well No. 3-67-6 cccl should be 3-66-6 cccl. Well No. 3-66-6 cccl is located correctly.

The enclosed map gives the water and bedrock elevations of the four (4) new wells drilled by the Corps of Engineers. They seem to be in disagreement with the U.S.G.S. bedrock elevations for these locations.

Chemical analyses for Well No. 2 are as follows: Chlorides-2,428 ppm, fluorides-3ppm and total solids-5,091 ppm.

Yours truly,

NEAL P. COCHRAN
Project Officer

Copy furnished:
CO, CmlC Engr Command, ACC, Md.
Attn: Dep for Engr
CO, CmlC MatCom, ACC, Md.
Attn: Mr. Dave Falck

1 Incl:
a/s

Copy furnished:
CO, RMA
Asst for Mfg

ASST FOR MFG

4547

C
O
P
Y

Tlephone Conversation

13 Aug 57
1100

From: Col W. A. Johnson

To: Col C. B. Drennon, Deputy Comdr, Hq ACC & MatCom

1. Colonel Johnson stated that before he went into the matter he was calling about, he would like to ask if Colonel Drennon would please make a check on the status of the request for renewal of category by our Lt. Wm A. Moore, Service Nr 04044887. Col Johnson advised that Lt Moore put in for Regular Army and has not heard from that, so he submitted a request for extension of category until the matter was determined. Col Drennon stated he was going to Washington tomorrow and will check into this matter.

2. Col Johnson stated that the other point he had to discuss was in connection with a complaint a couple of weeks ago about the smell coming off our sealed lake - the matter hit the columns of the local newspapers. Col Johnson advised that we received a TWX late yesterday afternoon from the Legislative Liaison Branch, symbol SACLL. He further advised that we sent a reply direct to SACLL, priority message, today, with a copy to OCCml0 and MatCom. Col Johnson stated that we have no idea what stirred up this inquiry, so we thought we should notify MatCom immediately and have them tell someone in the Chief's Office. Col Johnson read our reply to DA, and Col Drennon had his secretary take it down.

3. Col Johnson advised Col Drennon that Col Weirich would be back East on leave next week and would stop in to see him.

WAJ

Cy furnished:
Adjutant
Tech Liaison O

CMLMC-RM-OI

Report of Trip to Omaha Corps of Engineers, Omaha District, Omaha, Nebr., 1 & 2 July, by Mr. Cochran and Mr. Donnelly.

Asst for Manufacturing
Executive Officer
Comptroller
IN TURN

Chief, Ind Engr Div

10 July 1957
NPCochran/pw/532

1. Authority

A. CMLMC-RM-AA-60, 28 June 1957

B. Date of departure: 1 July 1957

C. Date of return: 2 July 1957

2. Purpose of Trip

To discuss location for a series of test wells to be drilled on Rocky Mountain Arsenal.

3. Names of Persons Contacted

Mr. Sisko, Omaha Dist. Corps of Engineers
Mr. Hipp, Omaha Dist. Corps of Engineers

4. Discussion

It was agreed that approximately 30 to 45 wells would be drilled approximately as shown on the attached sheet. In addition, 1 to 3 wells will be located in multiples and drilled to varying depths to determine whether any stratification exists in the under ground water table and 3 to 4 wells will be equipped with 2 inch piezometer tubes to provide for drawdown tests to determine underground water flows. Omaha District indicated, drilling could be undertaken as soon as the plastic pipe well casing had been procured.

5. Action to be Taken:

a. An RMA truck will be fitted out to provide power for pumping the wells.

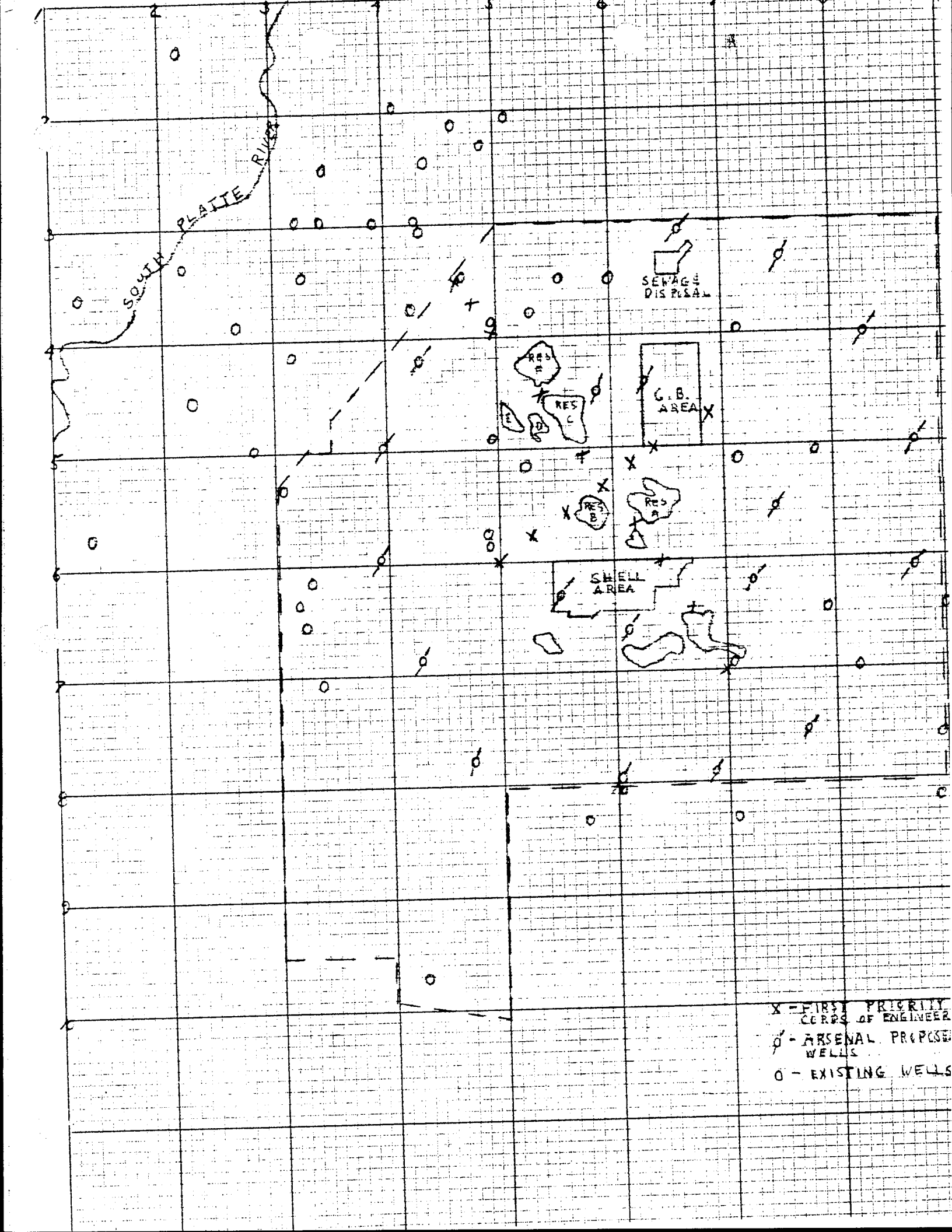
b. Funds will be requested to provide for sampling of the wells.

c. Procedure for sampling and running drawdown tests will be written.

NEAL P. COCHRAN
Chief, Ind Engr Div

Dist:
D. Falck
Asst for Mfg
Fac. Engr

ENCOM-Dep for Engr
I. B. Morgan


SOUTH PLATTE RIVER
SEWAGE DISPOSAL
RES E
RES C
RES D
G.B. AREA
RES B
RES A
SHELL AREA
X - FIRST PRIORITY
CORPS OF ENGINEER
- ARSENAL PROPOSE
WELLS
0 - EXISTING WELLS

C
O
P
Y

17 May 1957

Telephone Conversation

From: Maj W. G. Heslin, Ind Div, Mat Com

To: Col Grothaus

Maj Heslin advised that the Corps is getting a substantial amount of money, as Col Grothaus probably knew. Col Grothaus said the last time he talked to Col Merrill he said there was a rumor that we have a substantial amount of money coming.

Maj Heslin stated that the latest high level information on the CBR School is that it is down the drain. General O'Neill killed it.

Col Grothaus inquired as to Maj Coburn's status and Maj Heslin said he would ask Burger.

Maj Heslin stated that he had jumped on the people in General Currie's office. We had given them $160,000 of our M&O money to modify some buildings at Dugway. Since the School is now out, perhaps we can get this money back and redistribute it. The major question he had was that they have some projects in MatCom from Donnelly. He asked if Col Grothaus would just as soon go ahead and accomplish these projects this year or buy a couple of road graders and not have so many projects. There is available for the Corps $700,000 for heavy equipment but the money probably won't come out in time to buy heavy equipment for the next snow storm. He asked if we want to buy the heavy equipment now and knock out some small projects. $80,000 is available and the road graders cost about $23,000. Col Grothaus said Mr. Donnelly says we better take the road graders because the difference between that and what money they have is about all we can spend anyway. So, Col Grothaus asked Maj Heslin to get us the road graders and then the projects in their order of priority.

Col Grothaus explained that when he talked to Maj Heslin the other day he was disturbed about something that Alberding had told Donnelly - he wasn't talking about Maj Heslin's shop. He was interested that this discussion of charges to overhead not get started all over again. He said he told Col Merrill to get Alberding out of his business.

Heslin said on the sealed lake, he thought we were going to repair the rupture out of money presently on hand and put a PPFF in for the rip rap. Maj Heslin stated that he talked to the Chief's office on the PPFF request on the rip rap and the Chief's office says if we put a red tag on it, they can probably get it through in about a month.

DGG

Copies to: Asst for Mfg
Fac Engr Div
Compt

2175

CMLMC-RM-OIM

Evaporation From Sealed Lake

Chlorine Plant Mgr
Thru: Chief, Indus Engr. Div.
Thru: Asst for Mfg

Chf. Proc. & Meth. Br. 26 Mar 57
RESimmons/eh/6171

Reference: DF on above subject as of 20 Feb. 1957.

1. Discussions with persons concerned with this determination since the issuance of the referenced DF have brought out the following facts:

a. It would be very difficult for the plant to compute the amount of effluent they discharge into the contaminated sewer.

b. Installing a meter in the line would not be practical due to the high acidity of the effluent from the chlorine plant. The effluent would rapidly corrode and destroy any meter made of common materials.

2. This DF rescinds the one dated 20 February 1957.

3. The requirement, to determine the amount of effluent being discharged into the contaminated sewer by the chlorine plant, will be determined by subtracting the flow from the GB and Shell plants from the total flow.

4. The figure thus obtained will not be completely accurate due to the fact that it will contain what is discharged by the WP and Incendiary Plants. It appears that this is the most practical way of determining the discharge from the chlorine plant.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Br.

Asst for Mfg.

Engineering Chemical Laboratory

1791

81338R20

1st copy

FILE COPY

CMLMC-RM-OI (16 Aug 1957)
SUBJECT: Waste Disposal-RMA

1st Ind

NP Cochran/je/532
11 September 1957

13 SEP 1957

U. S. Army Chemical Arsenal, ROCKY MOUNTAIN ARSENAL, Denver 2, Colorado

TO: Commanding Officer, U. S. Army Chemical Center and Chemical Corps Material Command, Army Chemical Center, Maryland. ATTN: Chief, Industrial Division, CMLAM-M-ZP-42

1. The monthly reports of Contract No. DA 05-021-CML-10,092, Research on Phytotoxic Materials for the months of June and July 1957, were held up due to Mr. Cochran's being on TDY. These reports have now been distributed.

2. Due to a break in the lining of the sealed lake on 21-22 April 1957, the contents of said lake, above the break, were pumped to the adjoining reservoir and back again after the break was repaired, thus making it impossible to obtain a rate of evaporation during the period of May through August. No material was pumped to the sealed lake during this period, therefore, no monthly waste disposal reports were prepared for these months.

3. The monthly Waste Disposal Report for April 1957 is enclosed.

FOR THE COMMANDER:

1 Incl:
a/s

N. HO CRAWELL
Major, Cml C
Assistant for Manufacturing

Copy 1 furnished:
Asst for Mfg

KEAL P. COCHRAN, Chief,
Industrial Engineering Division

2

Incl 1 - As Listed Above

[redacted]

WASTE DISPOSAL REPORT

U. S. ARMY CHEMICAL ARSENAL

ROCKY MOUNTAIN ARSENAL

1 APRIL THROUGH 30 APRIL 1957

[redacted]

1. LIQUID WASTE TO DISPOSAL LAKE

A. From GB Plant (Quantitative and Qualitative)

1. Effluent from the chemical sewer, facility 1727, which is pumped to the sealed lake was metered at 1,350,000 gallons (37 GPM) during the month of April.

2. Analysis of Effluent

Component	15 April 1957	2 May 1957
a. Chloride ion (ppm)	931	1010
b. Fluroide ion (ppm)	26	21
c. Phosphorus ion (ppm)	203	118
d. pH	12.5	5.0

B. From Shell Chemical Activities

1. Effluent from the Shell Chemical Plant to the sealed lake totaled 3,744,000 (103 GPM) during the month of April.

2. Analysis of Effluent

Component	15 April 1957	2 May 1957
a. Sulfate ion (ppm)	530	110
b. Acetate ion (ppm)	8025	500
c. Chloride ion (ppm)	1970	9316
d. pH	11.7	1.0

C. From Chlorine Plant

Chlorine effluent to the sealed lake for the month of April is 2,000,000 (60 GPM).

D. Flow from Lake A

1. Effluent from Lake A to the sealed lake totaled 13,000,000 gallons for the month of April.

[redacted]

2. Analysis of Effluent

Constituent	15 April 1957	2 May 1957
a. Chloride ion (ppm)	213	5359
b. Fluoride ion (ppm)	14	30
c. Phosphorus ion (ppm)	212	1027
d. pH	1.7	5.8

3. Evaporation from Sealed Lake

1. Surface Area (Mean)

Surface Area at end of month = 78.6 acres
" " " beginning of month = 70.0 acres

Total 148.6 acres

Mean Area = $\frac{148.6}{2}$ = 74.3 acres

2. Precipitation entering lake

Total precipitation = 74.3 (Mean area of lake, acres)(precipitation, ft.) .300
325,829 (Gal/acre ft)

Total precipitation = Gal. 7,470,000

3. Total change in volume

Elevation of lake end of month = 5195.55 ft.
" " " beginning of month = 5194.71 ft.
Change in elevation = .84 ft.

Total volume change of lake = Vol. at 5,95.55-Vol. at 5194.71
" " " " " =
20,790,000 Gal.

120,190,000
- 99,400,000
20,790,000

4. Evaporation

Total liquid entering lake = effluent flow + precipitation
" " " = gal. 27,644,000
Total liquid entering lake = hal. 27,644,000
- Total change in volume = gal. 20,790,000
Evaporation = gal. 6,854,000
2

[redacted]

A. Evaporation (continued)

Evaporation = (Cal/month) 6,634,600 x Cal/min/acre x 2.03
(Mean acre) (min/month)

(74.3) 34,600 min/24 days

II. LOCAL ACTIVITIES

A. Status of Lake Drainage

The draining of Lake A continued until 23 April 1957 at which time it was shut off because of the discovery of a break in the seal of the sealed lake at the water line. Because of exceedingly heavy rains, it is estimated the capacity of the sealed lake is approximately 40 to 50 million gallons.

B. Status of Sealed Lake

1. The estimated quantity of water in the lake as of 23 April was approximately 105,000,000 gallons.

2. Immediately after the seal was found broken, plans were started to repair the damage. This necessitated setting up pumps to lower the water level approximately two feet. This is being done by pumping the water into Lake C. Since the damage was caused by wave action, plans are also being made to riprap the sealed lake so that this condition will not happen again.

C. The following are the elevations above sea level of water in wells from measurements taken each week for the last five weeks.

Well Number	11 April 1957	18 April 1957	23 April 1957	2 [illegible]
2-67-3aac1	5028.3	5028.2	5028.0	5028.2
2cdc1	5038.4	5038.4	5038.2	5038.1
9adb1	5037.3	5037.3	5037.2	5037.5
9dbb1	5041.0	5041.0	5041.0	5041.1
10abb2	5032.9	5032.9	5032.9	5032.6
10bdb1	5033.5	5033.5	5033.6	5033.6
10cbd1	5037.3	5037.3	5037.3	5037.2
10cdd1	5033.4	5033.4	5033.3	5033.2
11bcc1	5045.3	5045.3	5045.2	5045.1
11ccd1	5049.2	5049.2	5049.2	5049.2
12cbd1	5103.5	5103.4	5103.4	5103.4
16bdd3	5054.0	5054.1	5054.1	5054.1
16ccd2	5064.8	5064.9	5064.8	5064.8
16ddd2	5070.1	5070.1	5070.2	5070.2
15cdb1	5064.0	5064.1	5064.0	5064.1

[redacted]

c. (Continued)

USGS Well Number	READING 11 April 1957	READING 18 April 1957	READING 25 April 1957	READING 2 May 1957
15dcb1	5066.4	5066.4	5066.4	5066.5
15bdb1	5060.9	5060.8	--	--
22ddb1	5149.2	5149.1	5149.1	5149.1
23aaa1	5140.5	5140.5	5140.4	5140.4
23bcc1	--	5147.3	5147.6	5147.6
23adb1	5146.2	5146.3	5146.3	5146.3
24bdb1	--	5147.6	5147.5	5147.1
27baa1	5063.4	5063.4	--	--
27dcb1	5139.7	5139.2	5139.1	5139.0
33bcb1	5106.8	5106.8	5106.8	5106.8

Budd

[redacted]

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Day 2 18

MEMORANDUM FOR RECORD

7 January 1957

SUBJECT: Contaminated Water Problem

1. Reference is made to my memorandum, subject as above, dated 20 December 1956.

2. A visit similar to the one described in referenced memorandum was made by a group of farmers representing the West Adams Soil Conservation District on 27 December. Personnel attending the conference were as follows:

Representing DWA	Representing West Adams Soil Conservation Dist.	
Col Grothaus	Mr. James E. Fry, Jr.	Mr. William McCorkle
Col Johnson	Mr. Charles Davies	Mr. Pete Dilsaver
Lt Col Gay	Mr. Jesse E. Powers	Mr. William Sheehan
Mr. Donnelly	Mr. James L. Johnson	
Mr. Cochran	Mr. Robert Sakata	

3. The subject matter covered was substantially the same as in the case of the earlier visit. Significant points of difference are:

a. A ten-minute colored film on techniques employed in the building of the sealed lake was shown to the group in the conference room in Building 111.

b. Mr. Sakata mentioned the case of a Mr. Tashiro, a cantaloupe grower, who had adverse effects from irrigation water used on cantaloupes. Water came from a well, the significant point being that this well is located south of the area previously in question and in an area in which representatives of Colorado University had not been able previously to discover crop damage.

c. Reference was made at the conference by one of the farmers, Mr. James Johnson, to a meeting which had been held with Governor Johnson sometime ago in which they had asked the State for help in their problem. The Governor is reputed to have stated that there was nothing anyone could do for them, that it was up to the Federal Government and that Rocky Mountain Arsenal was at fault.

4. As in previous conferences an attempt was made to get the point across that there was much that wasn't known about the water situation. The group seemed to recognize this and seemed to be well impressed. I made the statement that when we had anything significant in the development of the water program, we would inform them as we had in this instance. The next foreseeable event appears to be results from the Colorado University contract.

Memorandum for Record
Subject: Contaminated Water Problem

7 January 1957

5. After the conference it was suggested by Mr. Cochran that it might be well to invite a representative of the West Adams Soil Conservation District to visit Colorado University during one of our routine visits so that he might see for himself the effect of water from the various wells on plant life in an experimental situation. I think it might be better to invite a Great Western Sugar Company representative. This last suggestion will be discussed with OCCmlO and Mat Com before any action is taken.

D. G. GROTHAUS
Colonel, Cml C
Commanding

Copies to:
Asst for Mfg
Legal Advisor
Mr. Cochran
Col Lough, OCCmlO
Col Merrill, Mat Com

CMLMC-RM-OE

Water Meters in GB Area

Chief, Production Division
Thru: Asst for Manufacturing

Chief, Facility Engr Div

20 February 57
EZeorian/ag/6022

1. The requirement for recording the process and potable water usage by shift at each building in the GB Area is no longer required. A daily record of the liquid leaving the Chemical Sewer, Facility 1727, and the water transferred from the Process Water System to the Sanitary Sewer in Building 1703 should be maintained.

2. The reading of the meters every eight hours and the maintenance required to keep the units recording properly should be discontinued. If a restriction in flow is experienced, the meter or its nutating disk may be removed to obtain satisfactory flow. The two meters on the Chemical Sewer and Process Water System shall be kept in satisfactory operating condition.

3. A weekly report should be made to the Facility Engineering Office showing the amount of liquid pumped to the sealed lake and also the amount of process water metered to the Sanitary Sewer.

GEORGE F. DONNELLY
Chief, Facility Engineering Div

CMLMC-RM-CIM | Evaporation from Sealed Lake

: Facilities Engr Br | Chf Proc & Meth Br | 20 Feb 57
RESimmons/eh/6171

Thru: Chief Indus Engr Div

Thru: Asst for Mfg

1. It is requested that Facilities Engineering Branch report the following information to Industrial Process and Methods Branch on a DF by the 5th of each month for the previous month:

a. Elevation of water in the sealed lake.

b. Surface area of the lake at a point half-way between the elevation of the water in the sealed lake on the first of the previous month and the first of the current month.

c. The flow from the contaminated lake to the sealed lake.

d. Total precipitation for the previous month.

e. Mean temperature for each day of the previous month.

f. % relative humidity for each day of the previous month.

g. Wind speed and direction for each day of the previous month.

2. It is requested that the Shell Chemical Company read the meter, metering the effluent that flows from their plant into the contaminated sewer, on the first of each month and report this reading to the Industrial Process and Methods Branch.

Asst for Mfg

A. W. SPIGARELLI
Capt. CmlC
Chief, Process and Methods Branch

CMLMC-RM-CIM

: GB Plant Manager
Thru: Chf Indus Engr Div
Thru: Asst for Mfg

Evaporation from Sealed Lake

Chf. Proc & Meth Br

20 Feb 57
HESimmons/eh/6171

1. It is requested that you have the meter, metering the effluent from the GB Plant into the contaminated sewer read on the first of each month and report this reading by DF to the Industrial Process and Methods Branch.

2. It is further requested that the samples of effluent from the GB Plant, the Chlorine Plant and the Shell Chemical Company, which will be delivered to the GB Plant laboratory on the 15th and 30th of each month, be analyzed and the results of this analysis be reported to the Industrial Process and Methods Branch by DF on the 5th of the following month.

3. The GB Plant effluent is to be analyzed for the following:

   a. Chloride

   b. Flouride

   c. Phosphorus ions

   d. PH

4. The Shell Chemical Company plant effluent is to be analyzed for:

   a. Sulfate

   b. Acetate

   c. Chloride ions

   d. PH

5. The Chlorine Plant effluent is to be analyzed for:

   a. Chloride

   b. Flouride

   c. Phosphorus ions

   d. PH

Asst for Mfg

SUBJECT: Evaporation from Sealed Lake

6. That the GB Plant laboratory furnish bottles to the Maintenance Division for collecting these samples.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process and Methods Br.

CMLMC-RM-OIM

Evaporation from Sealed Lake

: Mgr. Chlorine Plant
Thru: Chf Indus Engr Div
Thru: Asst for Mfg

Chf. Proc & Meth Br

20 Feb 57
RESimmons/eh/6171

1. It is requested that the Chlorine Plant determine the amount of effluent they discharge into the contaminated sewer each month and report this figure on a DF to Industrial Process and Methods Branch.

2. The above report is to be submitted by the fifth of the following month.

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Branch

Asst for Mfg

1076

CMLMC-RM-OIM

Evaporation from Sealed Lake

: Chief Maint Div
Thru: Chief Indus Engr
Thru: Asst for Mfg

Chf Proc. & Meth Br

20 Feb 1957
RESimmons/eh/6171

1. It is requested that the Maintenance Branch perform the following duties in connection with evaporation studies of the sealed lake:

a. On the first and fifteenth of each month the Maintenance Division will collect samples from the following places and deliver them to the GB Plant Laboratory.

(1) Shell Chemical Plant effluent

(2) GB Plant effluent

(3) Chlorine Plant effluent

2. Bottles for collecting these samples will be obtained from the GB Plant Laboratory.

Asst for Mfg

A. W. SPIGARELLI
Capt. CmlC
Chief, Process & Methods Br.

1677

CMLMC-RM-CI
Manager, GB Plant
THRU: Asst for Mfg
THRU: Production Div

Analysis of WaterSamples
Chief, Ind Engr Div

25 Jan 1957
Capt.Friar/djb/451

1. It is requested that water analysis of GB and shell effluent samples be performed by the GB lab. These samples will be brought to the lab twice every month.

2. The shell effluent will be analyzed for:

a. Sulfate ppm
b. Acetate ppm
c. Chloride ppm
d. pH

3. The GB effluent will be analyzed for:

a. Chloride ppm
b. Fluoride ppm
c. Phosphorus ppm
d. pH

4. The above analyses are required by Materiel Command for inclusion in the Monthly Production Report.

CLYDE L. FRIAR
Captain, Cml C
Chief, Ind Engr Div

Asst for Mfg

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P
Y

MEMORANDUM FOR RECORD 7 January 1957

SUBJECT: Contaminated Water Problem

1. Reference is made to my memorandum, subject as above, dated 20 December 1956.

2. A visit similar to the one described in referenced memorandum was made by a group of farmers representing the West Adams Soil Conservation District on 27 December. Personnel attending the conference were as follows:

Representing RMA	Representing West Adams Soil Conservation Dist.	
Col Grothaus	Mr. James E. Fry, Jr.	Mr. William McCorkle
Col Johnson	Mr. Charles Davies	Mr. Pete Dilsaver
Lt Col Gay	Mr. Jesse E. Powers	Mr. William Sheehan
Mr. Donnelly	Mr. James L. Johnson	
Mr. Cochran	Mr. Robert Sakata	

3. The subject matter covered was substantially the same as in the case of the earlier visit. Significant points of difference are:

a. A ten minute colored film on techniques employed in the building of the sealed lake was shown to the group in the conference room in Building 111.

b. Mr. Sakata mentioned the case of a Mr. Tashiro, a cantaloupe grower, who had adverse effects effects from irrigation water used on cantaloupes. Water came from a well, the significant point being that this well is located south of the area previously known to be affected an in an area in which representatives of Colorado University had not been able previously to discover crop damage.

Memorandum for Record
Subject: Contaminated Water Problem

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c. Reference was made at the conference by one of the farmers, Mr. James Johnson, to a meeting which had been held with Governor Johnson sometime ago in which they had asked the State for help in their problem. The Governor is reputed to have stated that there was nothing anyone could do for them, that it was up to the Federal Government and that Rocky Mountain Arsenal was at fault.

4. As in previous conferences an attempt was made to get the point across that there was much that wasn't known about the water situation. The group seemed to recognize this and seemed to be well impressed. I made the statement that when we had anything significant in the development of the water program, we would inform them as we had in this instance. The next foreseeable event appears to be results from the Colorado University contract.

5. After the conference it was suggested by Mr. Cochran that it might be well to invite a representative of the West Adams Soil Conservation District to visit Colorado University during one of our routine visits so that he might see for himself the effect of the various wells on plant life in an experimental situation. I think it might be better to invite a Great Western Sugar Company representative. This last suggestion will be discussed with OCCml0 and MatCom before any action is taken.

D. G. GROTHAUS
Colonel, Cml C
Commanding

Copies to:
Asst for Mfg
Legal Advisor
Mr. Cochran
Col Lough, OCCml0
Col Merrill, Mat Com